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A MONTHLY REVIEW OF SURGICAL SCIENCE AND PRACTICE.

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No. 1

ORIGINAL MEMOIRS.

SUBDURAL INTERPOSITION OF RUBBER TISSUE WITHOUT REMOVAL OF THE GASSERIAN GANGLION IN OPERATIONS FOR TIC DOULOUREUX.¹

BY ROBERT ABBE, M.D.,

OF NEW YORK CITY,

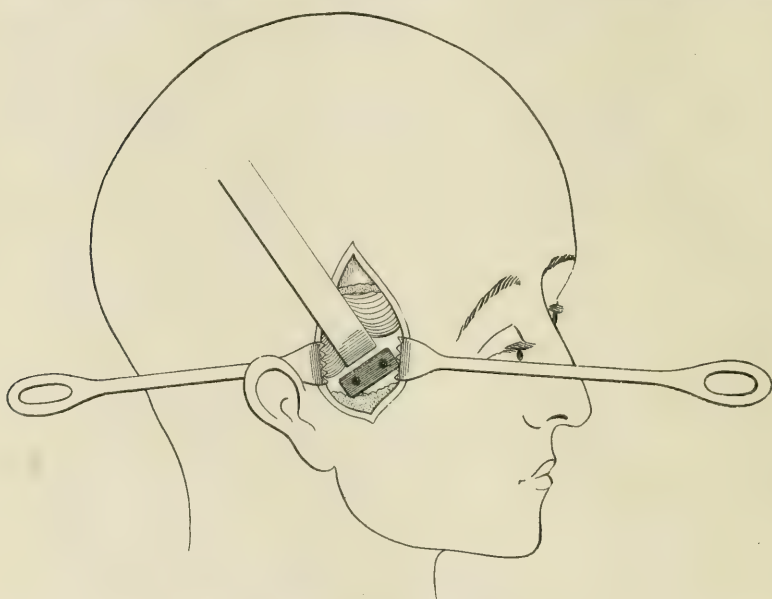
Surgeon to Saint Luke's Hospital.

THE victim of tic douloureux has received the utmost consideration from time immemorial; his sufferings cannot be exaggerated; the maddening repetition of intense pain almost leads to suicide at times. He has usually looked to medical aid in vain, but turning to surgery, a graded scale of more or less successful operations has been offered to him, varying in severity, in promise of ultimate success, and in gravity.

A scrutiny of the methods of past and present shows a decided tendency to attack the deeper parts of the nerve-roots with more freedom and much greater success. In the light of the widest experience, one may say that, to-day, the comments made in the earlier part of the century by Brodie, Velpeau, Stromeyer, and others, of the notorious failure of simple nerve-section in tic douloureux are thoroughly borne out. Later exhaustive resection of the entire second branch of the fifth pair from the foramen rotundum, practised by Carnochan and

¹ Read before the New York Surgical Society, October 8, 1902.

others, has met with much success in relieving pain for short periods of one or two years, in most cases. Extensive resection, also, of the inferior dental has offered a brief respite, usually counted by months. It remains for the elaborate operation of the intracranial resection of Hartley and Krause to give the greatest measure of success with reasonable safety. As the field of operation has gone deeper, we find the risk greater and the technique somewhat more difficult. The question of the



Modified operation with interposed rubber tissue.

removal of the Gasserian ganglion in every case has recently been advocated as the proper course for a surgeon to pursue. This unquestionably adds to the difficulties and dangers of the procedure, and can only be justified by its superior effectiveness. My own experience leads me to oppose this advice. If I needed any better text to justify this discussion of the subject, I would quote a sentence from a recent exhaustive article by Dr. Lexer, assistant at Von Bergmann's Clinic (*Archiv für klinische Chirurgie*, Vol. lxxv, 1902), saying that "Positively good results can only be reached by complete removal of the

ganglion." Appended to his article is a *résumé* of 201 cases from all literature of ten years up to date by Türk. Of these 83 per cent. survived the operation, and 77.6 per cent., or 156 of 201, could be regarded as permanently cured. Of the thirty-three cases of death, seventeen died at the close of operation; eleven died of collapse without regaining consciousness, seven of meningitis, one from infection from without, where the patient tore off the bandages in delirium; two of brain tumor, one of brain abscess, one of softening of the temporal lobe, two cases of postoperative pneumonia, one of heart failure, one of hæmorrhage, one of uræmic coma. Three died without cause of death reported. In two cases at death, brownish softening of the cortex of the temporal lobe was found, and in one of these œdema of the pia mater. Moreover, he says, in other fatal cases temporal lobe injuries were found in addition.

Thus we cannot fail to be impressed with the increased gravity of operation when the Gasserian ganglion is operated on. With the seriousness of this no one who has done the operation can fail to be impressed. The fact of hæmorrhage and the necessarily severe handling of the anterior lobes of the brain during the uncovering of the nerves adds much to the gravity of the procedure. Too great energy on the part of an assistant will crowd the retractor upon the brain with almost crushing force, when we consider the softness of this structure. The varying degree of shock which accompanies the evulsion of the ganglion is always to be feared and guarded against.

The only case of death occurring in my own experience was from the shock of evulsion in a woman of sixty-three, reported among my earlier cases of the Hartley operation in the *Journal of the American Medical Association*, May 5, 1900. Of the seventeen fatal cases of ganglion removal reported above by Lexer and Türk, eleven died from shock.

I have been so impressed with these facts that I have tried to arrive at a safer and equally effective method, which I am prepared to offer with sufficient evidence to make it seem to me worthy of confidence.

Six years ago this month I presented to this Society the first case in which I carried out the following simple procedure. The patient is now again shown in perfect health.

A man of forty-six years had suffered the most violent tic douloureux on the right side of his face for three years. His teeth had been extracted, and two external operations had been done before I saw him, with only brief respite. The spasms were so intolerable that the patient had contemplated ending his life. I tried to expose the nerve-roots by the Hartley intracranial method, but the hæmorrhage was very grave on all sides, and I was obliged to pack the wound with iodoform gauze. On the next day I continued the dissection under ether with great care, but the deep hæmorrhage was too great to permit me to complete the exposure. Again I packed the wound and left it two days more. On removing it I made an excellent exposure of the second and third branches, which I clamped in artery forceps and cut off at their foramina, and by rotation evulsed them from the Gasserian ganglion. Less than one-half inch of nerve was torn out, and the hæmorrhage was so violent again that, in further attempts to dissect away the ganglion, I was forced to desist. Impressed with the probability of the future union of the divided branches, it occurred to me to interpose a small sheet of sterile rubber tissue under the ganglion covering both foramina of exit. This was pressed down upon the bone by iodoform gauze, which was left *in situ* for another day. At the end of the fourth day, without anæsthesia, the gauze was removed; the wound was dry; the tissue was seen lying flat over the foramina; the brain settled down upon it, and the wound was closed with a few stitches. The patient left the hospital in three weeks well, and has never had a twinge of pain since, the rubber tissue presumably remaining as placed.

I then said that this new principle of the interposition of a sheet of rubber tissue as a permanent barrier to the reunion of a divided intracranial nerve might obviate the extensive destruction of the Gasserian ganglion. I have now had five opportunities of proving the truth of this assertion. Since then several operators have advocated more and more extensive

resection of the ganglion until the limit of anatomical dissection has been reached, and, in my opinion, the boundary of safety has been overstepped.

Some important considerations of this subject must be considered here.

(1) The nature of the disease.

(2) The question of regeneration of the nerves.

(3) The value, safety, and durability of the interposed non-conductor.

1. I have been much impressed in many of the anterior resections of the second and third branch which I have done, either where the inferior dental nerve has been exposed in its bony canal without handling, or where the second branch has been dissected from its canal in the roof of the antrum, with the fact that there appears a deep purple congestion of the nerve in parts, while adjacent portions appear white and normal. Microscopically, these dusky portions show an inflamed nerve-sheath. It has seemed to me that, usually, the evidence of nerve inflammation is found entirely anterior to the Gasserian ganglion. The proximity of these exposed nerves in the dental canals and adjacent to the easily infected mucous cavities of the antrum and mouth make it seem probable that the primary neuralgia is due to exposure to infection or cold, and that in these canals the nerve-sheath inflammation is more persistent than in other parts of the body. Pathologically, excepting in cases of bony tumor or disease of the cranial bones like exostosis, I believe the diseases of the nerve will nearly always be located anterior to the Gasserian ganglion.

2. It is of vital importance, in considering this subject, to study the regeneration of nerve-trunks after resection, and in this field we have a most valuable addition in the recent researches of Ballance and Stewart, who have shown that regeneration begins both in the proximal and peripheral ends at the end of a fortnight, both in the myelin sheaths and the neurilemma cells. The invasion of neuroblasts comes from the distal as well as the proximal segment travelling along the line of new vessels invading the intermediate scar-tissue. The new

myelin sheath-cells are seen at the end of two weeks in the proximal end, and a week later in the distal, while at the end of four weeks they are in greater abundance in the distal and in the intermediate scar-tissue, indicating that regeneration takes place more actively in the distal end. The same process precisely has been studied in the regeneration of axis-cylinders. Ballance and Stewart consider they have clearly established that regeneration does not take place by a process of outgrowth from the proximal segment, but is commenced and completed by the activity of cells already existing in the trunk of the nerve. This extreme activity of nerve repair leads one to look for some method of interposing a barrier between these nerve ends. We know that if, during the first few months of active growth, their cell extension can be checked, the firm connective fibrous tissue will soon shrink, and suppress the surrounding vascularity and development of nerve tissue, so that a walled-off fibrous stump must be formed.

3. To consider the question of the material most serviceable for interposition. In 1895, I interposed a circular piece of sterile rubber gutta-percha tissue between the brain surface and dura mater to prevent adhesions recurring which had caused convulsions. Dr. Beach, of Boston, had previously used gold foil for the same purpose; but it seemed to me rubber tissue would be less likely to disintegrate or be perforated in time. My patient was shown to this Society one and one-half years after the tissue implantation, and had remained entirely free from convulsions during that time. Before operation, his convulsions had recurred several times daily, and had continued for a year. The rubber tissue remained quiet upon the patient's brain. Whether it was altered or disintegrated by time, I have no means of knowing. As to its durability, I can only quote another case in which I applied rubber tissue to the brain for similar reasons. The scar was in the forehead, became infected, and the tissue was removed from the sinus months later in a crumpled form, but partly broken up, owing to nature's attempt to expel it through the sinus. This is the only case I know of demonstrating the presence of rubber tissue after a long time.

and it is reasonable to think that where it remains buried in healthy tissue it maintains its integrity. In five cases I have used this interposed rubber tissue after section of the nerve-roots in the intracranial operation for tic douloureux. The results have been perfect, both as to permanence of cure and persistence of the tissue. One case dates more than six years, one five years, one two and one-half years, one one and three-quarters years, and another six months. I would mention one other case in which I did the Salzer operation four and one-half years ago. Anterior to the skull, I laid a piece of rubber tissue with reasonable accuracy over the resected nerve ends in the sphenomaxillary fossa. This case remains well; hence I feel no hesitation in saying the value and safety of the use of this non-conducting medium are now established.

Operation.—I would advocate hereafter, in grave cases of tic douloureux, that the surgeon should not temporize by any of the external methods of operating, but at once resort to this, which now seems to me the proved and radical cure in its safest form. The external carotid artery may be ligated with advantage in controlling hæmorrhage. A vertical incision over the middle of the zygoma carried through the temporal muscle to the bone divides no important nerve or vessels. The muscle is scraped to either side and held by retractors. A small opening is then quickly made by mallet and gouge, and this is enlarged rapidly and safely to an inch and a half diameter. No better exposure can be had by any incision than this simple straight one. The dura is then pressed away from the middle fossa until the nerves are exposed. The much complained of hæmorrhage from venous sinuses on dissecting up the periosteum can be best controlled, and very quickly, by pressing a strip of rubber tissue upon the place with a firm pad of gauze in strips. The clotting of blood under the rubber tissue takes place very quickly, while if plain gauze is put in contact with the bleeding point, the blood being sucked up into it, prevents clotting. The nerve-trunks I grasp in separate artery clamps, divide each close to the foramen of exit, and, either by cutting or by rotation of the forceps, separate them from the Gasserian ganglion.

The wound is packed for a few moments with narrow strips of iodoform gauze until dry. A piece of thin gutta-percha tissue, stiff enough to be easily handled, is sterilized by rubbing with bichloride solution, and kept in salt solution for a few moments before operating. This is cut one and one-half inches long and three-fourths of an inch wide. This is laid carefully over both the foramen rotundum and ovale, where the nerves have been separated and pressed carefully into place by iodoform gauze. In a very few moments the gauze may be drawn away and the Gasserian ganglion allowed to settle down upon the rubber tissue. A small drainage-tube should be placed in the angle of the wound for a few hours to insure a perfectly dry healing.

It certainly is past dispute that there is no need for the removal of the *first* branch of the fifth pair in any case of grave tic douloureux unless the origin is to be found in a tumor of the Gasserian ganglion or behind it.

Conclusions.—I think I have demonstrated (1) that the operations upon the ganglion have been carried to an unnecessary degree of severity; (2) that resection of one-fourth or one-half inch of the nerves anterior to the ganglion and within the cranium, with the interposition of rubber tissue, can be relied upon for perfect cure, up to six years at least, with probability of permanency as great as by any method; (3) that it is a simple, speedy, and safe method, and thereby fulfils the highest aims of the best surgery.

CONSIDERATIONS RELATIVE TO BASEDOW'S DISEASE.¹

THE APPLICATION OF "REGIONARY ANÆSTHESIA" IN ITS SURGICAL TREATMENT.

BY THOMAS W. HUNTINGTON, M.D.,
OF SAN FRANCISCO.

HOFFMANN, of Düsseldorf, is authority for the statement that we owe our knowledge of Basedow's disease to von Basedow, a physician of Magdeburg, who described it in 1840, and first drew attention to the three symptoms,—acceleration of the heart, protrusion of the eye, and enlargement of the thyroid gland. There were, however, earlier observers of this symptom complex. Morgagni recognized the disease in 1761, and Parry published an observation in 1786, whilst Graves gave his description in 1835. The disease, on this account, is differently named in different countries. The English call it Graves's disease. In Italy it is called *Morbo di Flagani*, from Flagani, who also gave an early and exact description. The case of Esterreicher's is famous as illustrating the influence of heredity. Of the ten children of a hysterical mother, eight had Basedow's disease, and one daughter had three children who also had Basedow's disease. According to Buschan's statistics, 1894, of 980 cases, 805 occurred in women, 175 in men. Sixty per cent. of the cases occurred after the thirtieth year, but no age was exempt.

Exophthalmic goitre seems to have attracted little attention on the part of American surgeons. In an elaborate monograph upon this subject, published during the past year by Albert Kocher, there appears a bibliography which comprises practically all that has been written in every language. Reference is here made to 1423 contributions. One hundred and nine of these are credited to seventy-four American authors.

¹ Read before the San Francisco County Medical Society.

More than 90 per cent. of the latter are neurologists or practitioners of general medicine. A large proportion of the contributions appeared prior to 1890, before the disease was regarded as within the domain of the surgeon. Literature bearing directly upon the surgical treatment of Basedow's disease is confined almost entirely to German, French, and English authorities.

Basing an opinion upon the work done, and the success achieved by such men as Kocher, father and son, Tuffier, Mikulicz, and many other European authorities, there can be no doubt that partial extirpation of the thyroid gland must be regarded as a thoroughly accredited procedure for the relief of Basedow's disease. A few American surgeons, notably Rixford, of San Francisco, have added much to our knowledge of the general subject.

Etiology.—Under this head, I can do no better than to present in brief the views of Kocher as set forth in the classic monograph above mentioned. This is done chiefly for the purpose of showing the unsatisfactory condition of our knowledge.

Kocher states that Basedow inclined to the belief that the condition depended upon a primary blood change, and regarded the symptom complex as a sequence thereto. He calls attention to the fact that there is no characteristic alteration either in the blood-corpuscles or in the hæmoglobin content; furthermore, while Basedow asserts that there is an antecedent chlorosis, it may be positively stated that this condition is altogether exceptional. He inclines to the belief that in many cases, anæmia, the beginning of puberty, or unusual demands upon the circulatory system, may light up the disease. In this connection he remarks that it is apparent that these influences positively affect the chemistry of the thyroid gland.

Stokes advances the opinion that Basedow's disease usually follows a primary heart lesion; but Kocher discounts this idea, and quotes two cases with compensated mitral insufficiency which were cured by operation without in any way affecting

the heart lesion, showing non-interdependence of the two conditions.

Lempke regards Basedow's disease as an affection of the muscular system. Kocher admits that many of the symptoms appear strongly to support this hypothesis, and quotes Askanzi's statement that there is found in these patients a histological muscle change, the so-called lipomatosis.

Kocher alludes to the position held by Renaut as follows: basing his opinion upon the histological findings of the affected gland, Renaut regards cirrhosis as the typical picture in Basedow's struma, attributing this to a faulty lymph circulation. Kocher himself confirms Müller's statement that in almost all cases of Basedow's disease the lymph glands of the neck are markedly enlarged, and expresses the belief that Renaut's theory seems in a certain sense tenable, but considers the alteration of the lymph circulation rather as a consequence than a cause of the disease.

Charcot advanced the neurosis theory of Basedow's disease, alleging as the cause an alteration of the ganglion cells of the cerebral cortex. This theory is also ably advocated in Germany by Buschan. Combating this theory, Kocher says that the best evidence against it lies in the beneficent influence of operation. On the other hand, the importance of nervous influences must not be overlooked in the small percentage of cases occurring in individuals of a neurotic heredity. Answering Buschan's assertion that the cases cured by operation are not genuine, but pseudo-Basedow cases, and that only the uncured ones are genuine, Kocher refers to his own ninety-one operated cases as sufficient to prove the fallacy of Buschan's assertion.

Kocher's individual belief is that the complicated clinical picture in these cases cannot be satisfactorily explained by the assumption of a definite change in the sympathetic fibres limited to the cervical branches. He thinks it more likely, and in consonance with both the clinical and anatomical findings, that there is an involvement of the entire sympathetic system, including the vasomotor centre.

Unfortunately, the histological studies up to the present time have been incomplete and fragmentary, and we must await the results of more exhaustive analysis before satisfactory conclusions can be drawn. Alluding to the physiologico-chemical researches of the last ten years, he adds, we have as a resultant the accumulation of important and somewhat suggestive data. In the present state of our knowledge, while there is a strong presumptive evidence that certain substances, imperfectly studied, are native to this gland, we can as yet assign to them no definite pathological value.

Hammarsten's observation in this connection is of peculiar interest. From his work on physiological chemistry we obtain the following facts. The chemical constituents of the thyroid gland are little known. Bubnow has isolated a protein substance designated as thyreoprotein; and leucine, xanthine, hypoxanthine, iodothyrene, lactic and succinic acids have been found in extracts of the gland. The amount of iodine in the protein substance has been estimated by R. Hutchinson to be 0.309 per cent. Iodothyrene or thyriodine, according to Baumann, is the only active constituent of the thyroid gland. It is said to produce characteristic poisonous symptoms, is active in myxœdema, and its action is similar to that of the gland substance on metabolism and proteid destruction. This is denied by other investigators, and it is generally admitted that no one of the thyroid constituents thus far isolated possesses all the active properties, these latter being the united result of several other bodies.

The foregoing brief *résumé* serves to point out the possibilities of chemical research and to make clear the confusion and uncertainty that now prevail.

Statistical Review.—Rixford refers to a series of 190 operated cases collected by Starr in 1896, showing a mortality of 12 per cent.; and another by Kinnicutt, in the same year, of 187 cases, with a mortality of 7 per cent. It is probable that these comprise in large measure material from similar sources. The same writer has gathered from various clinics sixty-five operated cases with three deaths,—a mortality of 4.6 per cent.

Adding to these, fifty-nine cases reported by Kocher with four deaths, we have 124 cases with seven deaths,—a mortality of 5.6 per cent. It is reasonably certain that with the employment of local anæsthesia, a comparatively recent innovation, a lowered mortality rate will attend the efforts of coming years. From various sources we learn that the subsequent history of operated cases was altogether reassuring.

Of the cases collected by Rixford, fifty-eight were traced, of whom 81 per cent. were cured or greatly improved. Rixford refers to 230 cases collected by Ehrhardt, showing 68 per cent. cured or greatly improved.

In this connection I again take the liberty of quoting freely from Kocher's observations upon his series of fifty-nine cases, 90 per cent. were either cured or markedly improved. Of the fifty-five cases that recovered, thirty-nine, or 75 per cent., had disagreeable postoperative experiences, such as excitement, oppression, palpitation, paræsthetic heat sensations, tremors, diaphoresis, icterus, irregular and frequent pulse. These symptoms are said to have been often more harassing than before operation, though in sixteen cases they were absent. It is Kocher's belief that this exacerbation of Basedow's symptoms is due to the absorption of the gland secretion set free during the operation, which causes specific thyroid intoxication.

To the foregoing I may add three cases operated by Rixford and four by myself—seven in all—without a death; and the present status may be expressed as six cured and one greatly relieved (the latter the last of my own series).

Surgical Treatment.—Argument as to the legitimacy of surgical therapy in Basedow's disease is unnecessary. The transitory relief attending protracted efforts at medical and electrical treatment is generally admitted. It is a matter of surprise that competent observers should at this time persist in efforts that are altogether unsatisfactory and disheartening, advising radical measures only as a last resort. Kocher insists that all cases of Basedow's disease, and particularly those in the incipient stage, should be operated.

The argument for early operation in malignant disease

applies here with equal force. Extirpation, the only rational treatment, should be undertaken before destructive tissue changes have occurred, before the function of important organs has been seriously, perhaps permanently, impaired, and the patient's vitality lowered by chronic thyroid intoxication.

For obvious reasons, complete bilateral extirpation should never be attempted. A small fragment of the least affected lobe contiguous to the tumor can be isolated and left *in situ*.

Advanced cases requiring interference with both lobes should be undertaken in two steps, with an interval of from two to four weeks between operations.

The point made by Dr. Joseph A. Blake, of New York, that excision is better than enucleation in these cases, undoubtedly has merit. The former procedure is readily accomplished without hæmorrhage by applying double ligatures to vessels as they are exposed and dividing between. The latter procedure is inevitable when a lobe is to be divided, and in a few instances hæmorrhage from the parenchyma of the gland will exercise to a high degree the ingenuity of the operator.

In reviewing the detailed histories of a considerable number of cases resulting fatally within a short time after the operation, we cannot escape the conviction that general anæsthesia is, in a very large proportion of them, seriously at fault. There is no difference of opinion among operators as to the impropriety of general anæsthesia in this relation, and especially in advanced cases.

The facility and thoroughness with which local anæsthesia can be accomplished is almost universally recognized. Cocaine, or one of its analogous compounds, has supplanted chloroform and ether, and their great value is manifest in this over all other applications of these drugs.

Up to a recent date the exhibition of these agents has been by the ordinary hypodermic or Schleich method.

A few months ago, in an interview with Dr. J. Marshall Flint, Professor of Anatomy in the State University, he made the very pertinent suggestion that nerve-trunk cocainization, after the plan evolved by Professor Halsted and successfully

employed by Harvey Cushing in herniotomies, was practicable in this undertaking, and advised so dealing with the superficial cervical nerve. So far as I can learn, the employment of what Cushing terms "regionary anæsthesia" in three of the operations herewith reported is the first application of Halsted's idea to this undertaking. Although it was supplemented by a small amount of Schleich's solution, there is no doubt that the method can be relied upon independently in the average case. A somewhat elaborate statement as to the distribution of the nerve-trunk mentioned will be of interest.

This was kindly prepared for me by Professor Flint, and is given almost in his exact words.

Distribution of the Superficial Cervical Nerve. (*Nervus Cutaneus Colli.*)—The superficial cervical is one of the branches constituting the plexus cervicalis superficialis, which according to most anatomists consists of five main nerves. The superficial cervical branch has its origin from the second and third cervical nerves, and after passing lateralward behind the sternocleidomastoid it turns sharply and passes around the posterior border of that muscle and then runs forward to supply the skin of the anterior triangle of the neck. This occurs at a point corresponding almost exactly with the thyroid cartilage when the body is in a recumbent position, with the head on a level with the back. After passing around the muscle it runs ventralward beneath the platysma myoides and the external jugular vein. The relations which it has with the jugular vary considerably in different subjects, but it usually passes below. Their point of contact is at the level of the junction of the sternal and clavicular portions of the sternocleidomastoid. In most cases it furnishes at this point a small branch which mounts along the jugular vein and anastomoses with the descending branches of the auricularis magnus. It is not known definitely whether these are vasomotor nerves; but Cruveilhier in one subject has followed this branch of the superficial cervical to the skin of the subhyoid region. In the first part of its course the superficial cervical is covered by the superficial fascia and the platysma, while at the anterior border of

the sternocleidomastoid it perforates the fascia and ramifies under the skin in a series of cutaneous branches which are derived from two principal divisions,—the superior and inferior.

1. *Ramus Superior.* This branch is situated just below the hyoid bone and is a continuation of the main trunk of the nerve. It lies between the superficial aponeurosis and the platysma. Its divisions are very delicate, and are distributed throughout the subhyoid region towards the angle of the mandible, where it may pass up over the edge and anastomose with the mandibular branch of the facial. This has been described as the superficial cervical loop or loop of Langer.

2. *Ramus Inferior.* The inferior ramus divides into numerous branches which run along the internal border of the sternocleidomastoid in the subhyoid region and radiate towards the median line of the neck. The inferior branch sometimes anastomoses with the suprasternal branches of the supraclavicular. In some cases the superficial cervical nerves on opposite sides of the neck pass the median line and anastomose with each other.

To expose this nerve, the incision should be made along the posterior border of the sternocleidomastoid about the level of the thyroid cartilage. This may be done under cocaine anaesthesia. The area of anaesthesia, according to the anatomical distribution, obtained will be triangular, with its apex at this point and its base at the median line. The latter would practically extend from the suprasternal notch to the border of the mandible.

Direct experiment on the cocainization of nerves, however, has shown that the boundaries obtained in this way often vary considerably from those given in text-book descriptions. The reason, of course, is obvious, for many of the finer branches, which convey sensations, are often too delicate to dissect. Moreover, it is now well known that the areas supplied by adjacent cutaneous nerves often overlap.

The cocainization of the nerve-trunk after exposure can be readily effected by the introduction within the nerve-sheath

of two, or at the outside three, minims of a 2 per cent. solution of cocaine through a very delicate hypodermic needle. The duration of anæsthesia is manifest for a period of fully one hour. In the operations reported, I intensified the anæsthesia by the introduction of a small amount of No. 2 Schleich's solution; and in the third case reported below, it was necessary to administer a small amount of chloroform to the point of partial anæsthesia towards the end of the procedure.

CASE I.—M. N., aged twenty-eight years, born in Ireland. Family history unimportant. Was well until five or six years ago, then noticed enlargement over right thyroid. Principal symptom dyspnœa; later there was a recession of symptoms and improvement.

March 28, 1902. Present condition. The right lobe of the thyroid appears enlarged in all directions, its size being fully three times that of the normal gland. There is marked bilateral exophthalmos. For some time past hair has gradually become thinned. Patient complains of inordinate thirst. Is markedly excitable, cries without special occasion. There is marked dyspnœa on slight exertion. Pulse rapid, ranging from 120 to 140. Skin dry. Tremulousness of the tongue when protruded, and of the fingers in extension. Muscular weakness is a marked feature of the case. This is particularly noticeable in the erector spinæ and thigh muscles. When in a stooping or sitting posture, it is impossible for her to assume the standing position without assistance. There is pulsation over right jugulars, and with the stethoscope the characteristic arterial hum is perceptible. Von Graefe's sign absent. Operation advised.

March 30. Ether anæsthesia. Through a vertical lateral incision three and one-half inches long the right lobe of the thyroid was extirpated without difficulty. Pulse during operation was noted every five minutes, as follows: 140, 154, 135, 140, 130, 120, 114, 122, 130, 120, 130, 150, 180 186. Time of operation, one hour and five minutes.

After regaining consciousness the patient became very excitable and wept for some time. Vomiting persistent.

March 31. Condition favorable. Pulse, 130; temperature, normal. Vomiting and restlessness persist.

April 4. Ideal wound healing. Pulse, 100. Appetite good. Digestion perfect. She left the hospital at the end of eighteen days in excellent condition. Exophthalmos still manifest. Muscular weakness less noticeable. Was gaining weight rapidly.

May 2. Reported at office. Looks exceedingly well. Cheeks red. Has gained seven pounds since leaving hospital. Pulse 84 after walking two blocks. Exophthalmos scarcely noticeable. Nerve symptoms greatly improved. Muscular power nearly normal. Muscular tremor absent. The following pathological report was furnished at time of operation by Professor Ophuls.

The gland tissue contains several sharply defined spherical nodules, the largest being the size of a cherry, in which there are cysts with colloid contents. Sections show that the nodules are surrounded by a thin capsule of fibrous tissue.

Diagnosis.—Multiple cystic adenomata of thyroid.

CASE II.—Mr. M. H.; residence, Winnemucca, Nevada; a merchant; aged fifty-six years. Family history unimportant. Has been a tolerably free user of alcohol. About ten years ago noticed enlargement of left lobe of thyroid. For a long time this gave no discomfort, but in the last two years it has increased rapidly.

July 14, 1902. At the present time it appears as a tumor one-half the size of a large orange, extending from the median line laterally, beyond the posterior border of sternocleidomastoid muscle. Its lower margin extends slightly below the sternum. There is slight exophthalmos, with well marked tremor of tongue. Tremor in finger-tips not well developed. Maximum weight ten years ago was 165 pounds; present weight, 156 pounds. Venous pulsation and arterial hum manifest. Dyspnoea. Patient is irritable and easily depressed. Skin dry. Pulse ranges from 100 to 120.

July 15. Operation at Waldeck Sanitarium. Warned by my experience in the previous case, I determined to resort to local anæsthesia. Having exposed the left superficial cervical nerve, I introduced into its sheath two or three minims of a 1 per cent. cocaine solution. I then marked out the line of incision, following the transverse curve of Kocher. Along this line I injected Schleich's solution, and in a few moments proceeded to remove the tumor. This proved to be a large cyst, with a firm, fibrous sac containing from six to eight ounces of thick pultaceous fluid, liberally impregnated with lime salts. The removal of the sac

was accomplished without special difficulty and with the loss of but little blood.

Time of operation, fifty minutes. Patient complained of only slight pain, and there was practically no shock. Pulse during operation ranged from 110 to 130. Pulse at close of operation, 108. Recovery was rapid, and there was gradual recession of Basedow symptoms. He left the hospital at the end of ten days.

August 11. Reported at office greatly improved in every respect. Pulse 80. Venous pulsation and arterial hum absent. Exophthalmos barely noticeable. Psychic condition greatly improved.

CASE III.—An unmarried woman; residence, San Francisco; aged forty years. Family history unimportant. For about one year has experienced a feeling of fulness about the neck, which is described as a clutching sensation. For the past two months has noticed an enlargement over left lobe of thyroid. At the same time she has become slightly irritable, easily excited, and perceptibly weaker than formerly.

Present condition. Right thyroid enlarged in all directions to double its normal size. Weight normal, 145 pounds. Muscles of face seem drawn, and she presents an anxious appearance. Complexion good. Cries easily. Thirst exaggerated. Appetite capricious, and has little relish for food. Exophthalmos manifest to a slight degree. Muscular tremors well marked. Circulatory symptoms characteristic. Pulse ranges from 100 to 120.

July 17. Operation at Lane Hospital. Local anæsthesia. In searching for the superficial cervical nerve, it was inadvertently divided. A vertical line was then drawn over the tumor four inches long. Beneath this Schleich's solution No. 2 was injected. The incision down to the tumor and partial enucleation of the affected lobe were accomplished under the Schleich anæsthesia, but the patient complained so bitterly of pain that a small amount of chloroform, about one and one-half drachms, was administered, and the enucleation completed.

Time of operation, thirty-five minutes. Pulse-rate during operation from 110 to 130. Tumor consisted of a simple adenoma of the thyroid, and contained a few small colloid cysts. It was closely attached to the trachea, and its removal gave immediate relief to pressure symptoms. Patient made a perfect recovery

and left the hospital fourteen days after the operation. At the end of two months all Basedow symptoms had disappeared.

CASE IV.—Mrs. W. B.; residence, Oakland; aged forty-two years. Father died at fifty-five. Cardiac aneurism, otherwise family history unimportant.

Previous history. Has always been a slender, delicate woman, subjected to great hardships and badly fed. Maximum weight, 120 pounds; present weight, 110. For seven or eight years has noticed bilateral enlargement of thyroid. Right side more prominent than left.

Present condition. Patient is extremely thin and attenuated, pale and anæmic. Complains of exaggerated thirst, polyuria, extreme nervousness, and excitability. Bilateral enlargement of the thyroid to quadruple the normal size. Exophthalmos very marked. Von Graefe's sign well developed. Tremulousness of finger-tips and tongue. Arterial hum, venous pulsation. Pulse ranges from 120 to 140 when at rest. Skin dry. Hair markedly thinned.

August 5. Owing to the impoverished condition of the patient, I determined to remove the right half of the thyroid as a preliminary step, leaving the entire left lobe for subsequent operation if deemed best. Operation at City and County Hospital. Anæsthetic cocaineization of right superficial cervical nerve and local cocaineization of the skin in line of incision. A small amount of chloroform was administered during latter part of operation, though chloroform anæsthesia was not profound at any time. Pulse during operation ranged from 120 to 130.

Time of operation not noted. There was marked shock and exaggerated excitability subsequent to operation. For several days the pulse-rate was from 120 to 140, and the heart's action somewhat irregular. Wound healing was ideal, and after four or five days the patient's general condition began to improve perceptibly. She left the hospital temporarily twenty-four days after the operation. At that time she had gained weight. Muscular weakness, tremor of the finger-tips and tongue were somewhat modified. The heart's action was feeble and the pulse rapid, ranging from 90 to 100. Exophthalmos about as at time of operation. She returned a few days later, and I advised partial removal of the remaining lobe. This was accomplished on September 9, 1902, by the foregoing method, two-thirds of the lobe being left *in situ*. The anæsthesia was altogether satisfactory,

the patient making but slight complaint of pain. Wound healing perfect. In each instance the gland removed was found to be the seat of cystic adenoma of the thyroid. Since the last operation the patient's condition has improved rapidly. The exophthalmos has receded, although still apparent. She is less excitable. Appetite excellent. All Basedow symptoms greatly modified. Heart's action regular. Pulse-rate, 78 to 80. Arterial hum and venous pulsation have almost disappeared. She is bright, cheerful, and hopeful.

URETER-CATHETERISM: ITS PURPOSES AND PRACTICABILITY.¹

WITH THE PRESENTATION OF A URETER-CYSTOSCOPE FOR MALE AND FEMALE.

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THE purposes of ureter-catheterism in connection with the cystoscope are twofold,—for diagnosis and for treatment.

Diagnosis.—A. To locate the origin of pus, blood, tubercular products or bacilli, the various pyogenic infections, abnormally desquamated epithelium, etc., as to whether they come from (1) the bladder, (2) the right ureter, (3) the left ureter, (4) the right kidney, (5) the left kidney, (6) the right or (7) the left perirenal space, and communicating with the corresponding kidney or ureter.

B. To recognize and locate obstructive conditions in the right or left ureter from (1) stricture, (2) stone, (3) adjacent tumors, (4) bend or kink in the ureter from movable or dislocated kidney, (5) valvular junction of ureter and its pelvis.

C. To determine (1) the presence of two kidneys, (2) if only one, which is absent.

D. To determine the number of ureters present.

E. To determine the functional activity of each kidney separately and relatively, with respect to its excretion of urea, albumen, quantity of urine, the specific gravity, etc.

F. To determine the size and capacity of each kidney pelvis with respect to (1) hydronephrosis, (2) pyonephrosis, (3) total obliteration of kidney-secreting tissue.

G. If there be kidney disease present, to determine (1) if

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only one kidney is affected or both; (2) if only one, which is the affected one; (3) if both, which is the one more affected; (4) if removal of the worse one be advisable, is the other one able to carry on kidney function sufficiently? (5) if removal of one be advisable, and the other is capable of supporting life, will the operation remove the infection from the body, removing the possibility of dissemination or recontamination?

Treatment.—A. To enlarge narrowings or stricture at (1) the ureter openings or (2) in the channel of the ureters. By facilitating drainage through the increased ureter-caliber, thus obtained, to assist in the improvement of pyelitis, or pyonephrosis, unilateral or bilateral.

B. To irrigate and medicate (1) the ureters; (2) the kidney pelves of one or both sides.

C. To assist, by anæsthetizing and enlarging the ureter opening, the passage through it of a calculus or a plug of pus, blood, etc.

D. To use the ureter, after it is catheterized, as a guide in certain abdominal and pelvic operations.

E. By prolonged catheterization of a ureter to assist in the cure of ureteral fistula.

To give some indication of the practicability of ureteral catheterism, as well as its clinical advantages, I wish to refer briefly to some of the cases in which I have used it.

CASE I.—*Supposed Ureteral Calculi; Erroneous X-ray Diagnosis.*—G. E. P., male, aged thirty-five years, attorney, consulted me, on the advice of his brother, a practitioner of Chicago, in May, 1902. He said that he had recently experienced some return of symptoms that had been with him some three years ago, frequency of urination, etc., that were finally diagnosed as indicative of stone in the bladder, for which he was operated by the crushing method. This removed the stone but not the inflammation, and during the past three years he has had more or less of the irritative symptoms. I found no organic lesion present, and was giving mild, antiseptic treatment which was doing good, but on a trip to Chicago he was induced to have an X-ray photograph taken of his abdomen, on the suspicion that it might be a return

of the calculous deposit. What was his surprise and horror to be shown the shadows of three stones, evidently lodged in his left ureter, as the photographer explained to him. This was somewhat of a poser to me, when he recounted it to me on his return; nevertheless, as I had failed to notice any indications of the presence of urinary calculus at any point, I refused to be convinced without further evidence. While he thought it useless to make the test, since the stones could be plainly seen in the negative, he acceded to my suggestion of ureteral catheterism. Under cocaine anæsthesia, with my instrument, in about five seconds after entering the bladder I passed a flexible catheter into the left ureter (the one supposed to contain the stones) on up as far as the renal pelvis; not a particle of obstruction nor of scratchy feeling was perceptible, and the urine drained from that side during the next ten minutes was as clear as crystal. There was an immediate and complete disproof of the accuracy of the X-ray finding, and a large degree of relief to the troubled mind of the patient. I later had the satisfaction of an acknowledgment of similar import from the photographer, who thought it must have been "cherry stones," possibly lodged in the colon over the ureter.

CASE II.—*Chronic Unilateral Pyelitis and Cystitis; Pelvic Irrigation*.—A. J. M., male, aged twenty-eight years, street-car conductor, referred by Dr. Y. H. Bond in November, 1901. Following on an incompletely cured attack of gonorrhœa of two years previously, the patient had noted certain pains and dull aches in the bladder and perineal region that were growing and becoming a serious interference with the carrying on of his employment. I gave tonic treatment to his prostate, vesicles, and bladder, the organs which seemed to me to be at fault, attempting to eliminate a bacterial infection of colon bacilli with internal and local antiseptics, and giving periodic massages and hot rectal siphons. This was continued during November, December, and the following January with unsatisfactory results,—only moderate improvement, at best. In February, 1902, more because of the rebelliousness of the condition than anything else, I suggested ureteral catheterism, in order to learn if the infection reached higher than the bladder. On February 25, at my office, under cocaine anæsthesia, I catheterized the right ureter and drained good, clear urine therefrom. On March 26 I again catheterized the same (right) ureter with the same result,—clear, healthy urine. On April 14 I catheterized

the left ureter, and obtained definitely cloudy urine, containing pus and actively motile colon bacilli. Before withdrawing the ureter-catheter, but after removal of the cystoscope, I washed out the kidney pelvis with hot 2 per cent. boric acid solution, repeatedly running it in and out by means of funnel and rubber tubing. On May 7 I again catheterized the left ureter, finding the urine much clearer than on the previous occasion; and the boric irrigation was repeated. The same measures were carried out again on May 14, June 2 and 19, each time showing marked improvement in the urine in its clearness and freedom from infection; and the various symptoms for the first time had been ameliorated to a satisfactory extent. Each time after catheterism the patient went from my office to his work, which he was enabled to resume with energy and ability. He was discharged from further treatment, and has needed nothing of the kind for a number of months.

This was a case of bacterial infection and irritation, not only of the bladder and urethra, but also of the left ureter and pelvis; and as rapidly as the infection of the urethra and bladder was removed, it was just as quickly renewed from the infecting focus above. With this removed by the ureter washing, the whole case was cleared up and relieved. I have noticed in such cases of bacterial infection that one must be vigilant and persistent for some time after the disappearance of the bacteria, as they are prone to recur even after having been cleared up a number of times.

I have had two other cases—one male, the other female—that were the subject of unilateral pyelitis chronica that were markedly improved by similar pelvic washings. I have not yet seen any serious consequences ensue from ureteral catheterism; and I am the more convinced and gratified at this fact since I have had some experience with tuberculous infections of the urinary organs, that *noli me tangere* of this field. If there is anything that may be counted on to do harm to tuberculously inflamed urinary organs it is local instrumentation. And yet the records of the following two cases fail to indicate any harm done, and, on the contrary, recite extremely gratifying results for tuberculous processes.

CASE III.—Mrs. H. S., referred by my friend, Dr. Goodner, of Nashville, Illinois, came in January, 1902; aged twenty-five years. To rehearse the endless symptoms and agonies suffered by the patient afflicted with active tuberculous inflammation of the bladder and other urinary organs is scarcely necessary here; but this poor woman had her share of them. The symptoms began two months after marriage, in 1893. Without any vaginal discharge, she noticed rather rapidly increasing frequency in urination, and, as she expressed it, she could not hold the urine at all in a short time thereafter; there was much sediment in the urine, and often it was quite bloody, or the dripping of pure blood at the end of urination. There was some pain in the back on the left side, passing thence down into the left hip. She lost in weight, and at the time of her arrival in the city she looked cadaverous. The mixed urine taken from the bladder contained both blood and pus, as well as many tubercle bacilli. Cystoscopy with a Nitze instrument proved a failure because of the rapid clouding of the fluid medium; but with my own female cystoscope I not only discerned tuberculous ulcerations in the bladder mucous membrane, but succeeded in catheterizing both ureters successively. The urine from the right side gave pus, blood, and tubercle bacilli in abundance, whereas that from the left side showed only moderate involvement in the inflammatory process, and we could not find any tubercle bacilli in it. Iodoform-oil injections into the bladder were used regularly for a time. There was such decided amelioration in the symptoms and improvement in the general condition, clearing of the urine, etc., that the patient would not listen to any operative procedure, even if I had urged it on her, which I did not, in view of the improvement. If we could have eliminated tuberculous infection of the bladder and the other kidney, the removal of the tuberculous right kidney would have been the procedure of election. But since the bladder was proved to be involved, I deemed it best to try general tonic treatment combined with the iodoform injections mentioned. My last report from the patient is that she has improved much both locally and generally. Her weight has increased considerably.

CASE IV.—*Hæmorrhagic Cystitis and Pylonephritis Bilateralis*.—This case shows the difficulty and uncertainty of diagnosing the source of hæmorrhage from the urinary tract in some cases. I have on a former occasion reported a case of renal hæmorrhage

that gave symptoms and indications that led to the positive but erroneous diagnosis of the vesical neck as the source of origin. F. L. I., aged twenty-eight years, a storekeeper, male, was referred to me by Dr. W. H. Stauffer, of this city, on March 31, 1902. Following after a prolonged attack of acute primary urethral gonorrhœa, there were various heroic measures adopted by the patient's first physician, the final one being a strong irrigation of permanganate of potassium. This set up a severe strangury, excruciating pain both between and during urinations, and the passage of large quantities of blood in the urine, besides fever, chills, etc. On receiving the patient, Dr. Stauffer adopted various soothing treatments, but with only moderate degree of success, and then referred him to me. Because of the depleting agencies present, the patient was extremely weak and anæmic. With each act of urination there was spasmodic straining, severe pain, followed by the squeezing out of blood or clots. Strong sedative measures were instituted, absolute rest, hot applications, but no injections or irrigations into urethra or bladder. While moderate improvement resulted, there was persistence of the bleeding and of certain of the symptoms (strangury, etc.,) and occasional relapses, so that by the middle of April not enough benefit had been attained to justify the continuance of the measures directed on that line, which had included the injection of adrenalin and of gelatin solution, and the internal administration of ergot. Besides, his anæmia was becoming alarming.

Because of the persistence of the bleeding, notwithstanding the freshness and brightness of the blood (which would naturally incline one to think it coming from the bladder only), I began to think that it was coming from a point higher up in the urinary tract. Therefore, under cocaine anæsthesia, I introduced my cystoscope on April 20. Free bleeding from the bladder membrane was clearly evident in the neighborhood of both ureter openings. It was so free that no view could have been obtained by one using a lenscystoscope with fluid medium for bladder distention. The fluid would have been clouded almost before the instrument could be introduced, putting an end to the endeavor. With mine, however, and air-distention this made practically no interference, so far as the observation of the bladder was concerned; and when it came to inserting the catheter into the ureter opening, I adopted a manœuvre that was quite successful in keeping the field clear

of blood while I searched for the opening. That is, I ran the ureter-catheter beyond the end of the cystoscope, down into the base of the bladder where the blood was collecting in a little pool; an assistant kept up continuous aspiration from this pool by pumping on the outer end of the catheter while I was searching for the opening. It was easily found; the catheter was withdrawn sufficiently to bring it in range and run it into the ureter. A small quantity of very bloody fluid was the result, showing that, although bleeding from the bladder membrane had been demonstrated, that was not the only source: it was coming also from the left kidney. And, in order to complete the investigation, I catheterized the right ureter two days later, and drained bloody urine from it, too. Hæmorrhagic cystitis and pyelitis bilateralis, was the more complete diagnosis, then; and the numerous rod-shaped bacilli (colon) appearing in the two ureter urines gave a clew to the cause of the condition: Extension of a mixed infection upward, following a gonorrhœal urethritis, possibly superinduced by injudicious medication.

A surprising sequence of this instrumentation was that instead of its making the patient worse, causing renewed chills, etc., marked improvement began from that day, and he gradually recovered from the severer symptoms, while the bleeding, frequency, and other harassing effects disappeared to a large degree. Now there is occasional tingeing of the urine with blood when he has been too active physically, and he is not yet entirely well, but pelvic inflammations of the kind are not prone to get well in a hurry. I recently began the use of boric irrigations into the renal pelves, and have attained further benefit this way.

CASE V.—*Tuberculosis of the Bladder and Both Kidneys*.—Male patient, aged thirty-six years, referred by Dr. Vernon, of Charleston, Mo., consulted me first in December, 1901. He had had an attack of gonorrhœa sixteen years before, but the present affection was first felt nine years ago. There had been, in addition to the usual irritative symptoms, a large collection of pus in the urine, urinary frequency, and also occasional attacks of pain in the left renal region, simulating renal colic. I catheterized each ureter successively with local anæsthesia and without much inconvenience, notwithstanding the excessive tenderness always present in urinary tuberculosis cases; purulent urine was drawn from each side; and guinea-pig inoculation with each gave posi-

tive results, so that tuberculosis of both kidneys was proved; and through the cystoscope tuberculous ulceration of the vesical membrane was apparent. Iodoform emulsion injections, together with guaiacol and cod-liver oil internally, were used in this case also, and have given considerable improvement both locally and generally. Operative interference in this case is out of the question, of course. That was made evident by the ureteral catheterism. If this procedure were always followed out in such cases, we would not hear of one tuberculous kidney being removed while the other one, even worse affected, is left to do the work of two, fails in the undertaking, and the patient dies long before he otherwise would.

CASE VI.—*Movable Kidneys; Unilateral Pyonephrosis; Operative Fistula.*—Mrs. I. S., housewife, aged twenty-seven years. This case illustrates the necessity of making a complete rather than a partial diagnosis of urinary affections, and the difficulties that may follow neglect in this particular. Married in 1894, the trouble began in 1898, with frequency and pain in urination, and the occasional passage of blood in the urine. A surgeon diagnosed cystitis, and for its relief made an opening through the vesicovaginal septum; that opening has been draining ever since, even to the present day. It did not relieve the distress in frequency, nor the pain in the bladder and both lumbar regions; and when she consulted me in March, 1902, she had practically given up her care of her household. On looking into the bladder I could see the fistulous opening, from which the air of my inflation quickly escaped into the vagina. The bladder wall elsewhere was relatively unaffected. Catheterism of the ureters gave, for the right, clear, healthy urine; for the left, cloudy, purulent urine; and tests of the renal pelvis showed that it possessed considerable capacity,—was able to hold about a half-ounce of boric solution, the explanation of which was learned when I palpated the lumbar regions. While both kidneys were found to be movable (the right one moderately so), the left one hung far down into the abdomen while the patient assumed the erect posture, and easily slipped back into its proper place on her reclining. In falling downward and forward, it had been in the habit of making a kink in the ureter, obstructing the outlet through the ureter, distending the pelvis, and furnishing the “receptive state” for bacterial invasion that resulted in the pyelitis and incited the various symptoms of

which she complained. The indication in this case was, not the making of a urinary fistula, but the anchoring of the two kidneys in their proper place, followed, if it proved to be necessary, by the regular washing of the left renal pelvis. As she had suffered much both from the affection and from previous surgical manipulations,—she had been operated on three times for the closure of the fistula, and without success,—she could not be prevailed upon to undergo another surgical procedure of any kind, and so carries her condition to the present.

CASE VII.—*Pyonephrosis and Perirenal Abscess*.—Male, aged thirty-nine years, had suffered many years from pain in the back and other symptoms of chronic urinary affection. Because of this and of purulent urine present, the Harris segregator was used, giving comparatively clear urine from the right side but cloudy urine from the left. It was considered from this, by the surgeons who made the test, that there was pyelitis present. Later I was asked to make ureter-catheterism: I inserted the catheter into the left ureter, but it would go in only a part of the way; it was withdrawn and reinserted several times before it finally was pushed up about two inches into the ureter. Even then it did not drain immediately; so, after waiting ten minutes or so, I applied aspiration to the outer end of the catheter and by strong pumping got out *one drachm of pure pus*. Instead, then, of there being simply a pyelitis, there was renal abscess with an imperative demand for operative interference. On operating through the left lumbar region, I found the kidney dilated with over a pint of pus, and a stone in the renal pelvis. The segregator could not possibly have attained the results given thus by catheterism and the strong aspiration. The thick pus was not draining from the ureter, and could not have gotten into the segregator from the ureter, and hence could not have gotten into the segregator tube.

These cases present some of the clinical phases of ureteral catheterism. They do not rehearse anything so very remarkable in the way of results in treatment, etc., but they serve to show that ureter-catheterism, in both male and female, has been reduced to a practical procedure that should rapidly become of great service to the profession. It is no longer an idealistic manœuvre that we hear about but never see, but is one that

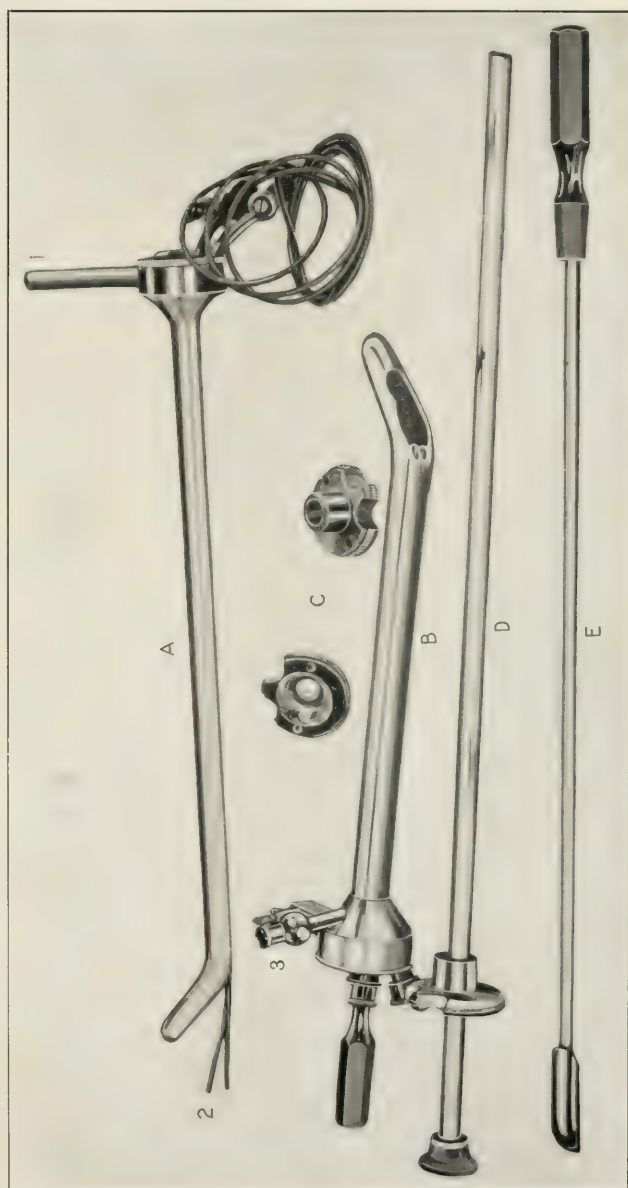


FIG. 1.—A, Male ureter-cystoscope; B, female ureter-cystoscope; C, windows of both; D, periscope or telescope; E, obturator of male instrument. 1, Handle for electric connection; 2, catheters projecting from ureter-tubes; 3, air-tube and cock.

is accomplished every day by those versed in it, and with the highest degree of satisfaction.

While the complicated and costly European instruments have not done much to popularize the procedure, I believe the simpler ones of American make will soon do the missionary work that will enlist the attention of the profession in the practical nature and value of this field.

While most of the ureteral catheterism that I have done has been accomplished with my model containing only one channel for ureter-catheter, my latest model is double-barrelled; so that with two catheters in place, after inserting the lighter colored one into the left ureter and pushing it far enough into the ureter to keep it from pulling out during the further manipulations, the inner end of the cystoscope is turned towards the other ureter, the remaining catheter (a dark one) is inserted into it in a similar manner; the cystoscope is then withdrawn, leaving the two catheters draining synchronously from the two kidneys. This (synchronous ureter drainage) is of great value, not only in the way of affording immediate results and avoiding repetition of the procedure, but also for comparing the secretions of the two kidneys at the same time and under the same general influences. This feature has been elaborately studied by Casper. By it is determined the relative functioning capacity of the two kidneys, etc.

Technique for the Bransford Lewis Ureter-cystoscope.—Extended descriptions of the previous forms of this instrument having already been given (first presentation before the American Association of Genito-Urinary Surgeons, May 1, 1900, *Journal of Cutaneous and Genito-Urinary Diseases*, 1900, page 420), the present form is easily understood (Fig. 1). Its main points are, an ocular tube, a handle, and a beak containing the small cold electric lamp. The electric contact is made at the handle. An obturator assists in the introduction of the instrument into the bladder, after which it is withdrawn and the ocular window is placed in its stead. This window is the only thing that intervenes between the eye and the object, that is, the bladder membrane, when it is undergoing inspection; there

are no lenses, no magnification, no inversion of image, and no fluid to look through or become cloudy and prevent inspection. The lamp is a cold one, so that it cannot burn the membrane even should the two come in contact. The bladder is inflated with air through the stop-cock on one side of the instrument; and there are appended tubes to conduct the flexible silk web ureter-catheters to a point within a half-inch of the lamp, that is, directly to the field of inspection, so that though they are flexible they are under full control of the hand. A late addition to the instrument is a telescope with lenses, that, if one wishes, he can insert through the main (ocular) tube and inspect the membrane with increased field and magnification. Another addition that I think will be more serviceable than this is a telescope with a prism at the inner end, that will enable the operator to "look around the corner," so to speak, especially for the purpose of bringing the hypertrophied prostate or outgrowths from it into view. With this assistance I expect the definite diagnosis of the form of prostatic enlargement to be much simplified.

For the satisfactory use of this instrument, it is necessary to have an operating table that is capable of giving high pelvic elevation, with the legs in flexion, for instance, in stirrups. With the patient placed in this position (excepting the pelvic elevation, which is made after the anæsthetic is applied), the bladder is washed and emptied with a soft rubber catheter. This washing is merely for antiseptic purposes, not for facilitating the work of the cystoscope. One or two cocaine tablets (one and one-eighth grains) are then deposited in the posterior urethra and bladder neck by means of my urethral tablet depositor (2, Fig. 2). The foot of the table is now elevated to an angle of about forty-five degrees; the cystoscope is introduced, the obturator withdrawn, the small quantity of urine that has been collecting since the washing is sucked out through the aspirator (3, Fig. 2), the window applied to the ocular end, and the light turned on. While the operator is looking through the main tube, he gently pumps in some warm air by means of the inflating pump, and watches the walls of the bladder unfold and



FIG. 2.—1, Aluminium swab or applicator; 2, urethral tablet depositor and obturators; 3, aspirator; 4, inflating bulbs with metal extremity for receiving warm air; 5, syringe; 6, funnel with tubing for irrigating kidney pelvis.

expand. A view of the whole interior of the bladder is obtained in panoramic sequence by moving the beak around; and when the ureter openings are looked for they are sought at the upper angles of the trigone. When the little ridge or dimple indicating the location of one is found, the catheter is easily shoved into it, and on up into the ureter. If it is desired to catheterize the other ureter also, the first catheter should be inserted rather far up, to insure against pulling it out in the further manipulations. Then the beak is directed towards the other ureter opening; when it is found, the remaining catheter is pushed into it in the same manner as previously described. The electric cord and the air-pump are disconnected, the air-cock opened, allowing of the escape of air from the bladder, and the cystoscope is removed. Care must be taken in doing this to feed the two catheters into the tubes as the cystoscope is being drawn out, so that when it is removed the catheters are still contained in the ureters, where they may remain and drain the ureters for from ten minutes to a half-hour, according to the amount of urine desired for testing. During this time the patient may lie comfortably on the same table, which has been replaced in a more normal position. If either catheter does not begin draining in a reasonable length of time, gentle aspiration may be made on it by means of the small syringe shown in 5, Fig. 2.

If it is desired to wash out the kidney pelves, that is done after finishing the drainage. A glass funnel with four or five feet of soft rubber tubing attached is filled with hot saturated boric acid solution and connected with the ureter-catheter by a smaller piece of tubing, a piece of glass tubing helping in the transition between sizes, if necessary.

After these several manipulations, irrigations of the bladder should be carried out with some mild, soothing antiseptic, such as warm boric solution.

In the female, examination of the bladder and ureteral catheterism are more easily carried out, both because of the shorter distance to the bladder, and because of the lessened resistance offered the inflow of air. If the clothing of the female is well loosened about the abdomen, on elevating the

pelvis and inserting the cystoscope and removing the obturator the bladder usually balloons out without the necessity of inflating with air. In the male, on the contrary, this is not usually the case, although it does sometimes happen where good anæsthesia is secured.

One of the most troublesome impediments to easy cystoscopy and ureter-catheterism by this method is that offered by the persistently contracting bladder,—a spasmodic condition that is beyond the influence of the patient's will, that holds the bladder walls in a rigid state, resistant to the required movements. This is best overcome by adding to the anæsthesia. Withdraw the cystoscope, drain the bladder of accumulated urine, and deposit one or two more cocaine tablets in the posterior urethra and vesical neck, then reinsert and continue the investigation. While no harm comes from the moderate inflation of the bladder with air, it is a fact that air is slightly more irritating to the membrane than water; but this is especially true of cold air. To obviate this, I am now using warm air, secured by an assistant holding the intake bulb over an alcohol flame during the process of inflation. When the telescope is in use, it is well to pump in the air through one of the ureter-tubes, since the telescope itself occupies the main tube. If at the same time it is desired to remove the balance of the inflowing urine, it may be aspirated through a ureter-catheter passed into the bladder through the other ureter tube. In several of the cases that I have catheterized, I feel positive that, because of the rapidity of accumulating blood, catheterism could not have been accomplished by means of the lens instruments and fluid medium.

I would not advise any one to attempt ureter-catheterism without sufficient equipment to secure, at least, the necessities of the work; and chief among these is a table that will furnish pelvic elevation. This allows the inflowing fluids or blood to gravitate away from the field of search.

I have been much interested in studying the limits to which one may go in putting cocaine into the bladder without causing a toxic effect. While I have on several occasions noted sys-

temic effect from the use of cocaine in the urethra, I do not remember of ever having observed it as a result of absorption from the bladder, although I have often used five or six grains in tablets. In doing litholapaxy in the aged, Dr. Chismore, of San Francisco, habitually injects two or three ounces of 3 per cent. cocaine solution into the bladder; and Dr. Swinburne has mentioned equally satisfactory results from a similar use of cocaine in litholapaxy. I use tablets made in two sizes, one-half grain and one and one-eighth grains. The Rochester Surgical Appliance Company, of Rochester, New York, are the makers of the cystoscope, and I take pleasure in thanking them for the able assistance they have given me in its development, as well as for their accurate workmanship.

ON A POSSIBLE CAUSE OF DIFFICULTY IN THE DIFFERENTIAL DIAGNOSIS BETWEEN RENAL CALCULI AND HEPATIC CALCULI.¹

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It is the aim of this paper to merely show the close relationship that exists between the pelvis of the kidney and upper portion of the ureter on the right side, with the gall-bladder, cystic duct, hepatic duct, and communicating duct of the liver and terminal ducts of the pancreas, with a sometimes similarity of symptoms from a pathologic invasion of any one of them, and more especially from stone formation.

A needle passed through the right lumbar region, piercing the pelvis of the kidney, would pass directly through the descending duodenum at a point where the ductus communis choledochus and pancreatic ducts open (lower third of descending duodenum), then into the transverse colon. The space passed through would be extraperitoneal. There is absolute apposition of the colon, duodenum, and kidney at this point, the supra- and infracolic portion being covered in front by peritoneum derived from the kidney region. A stone after passing through the cystic duct would not be impeded in its movements until it had dropped into the ampulla of Vater, at which point the ostium duodenalis, the most strictured portion of the canal, would have to be dilated, unless collateral biliary circulation should take place through an accessory pancreatic duct, before it would pass into the duodenum. In total occlusion of either the cystic duct or the ureter, the muscular

¹ Read before the Mississippi Valley Medical Association, October, 1902.

action in the gall-bladder and pelvis of the kidney would be the same.

Some one has said that pain in the interscapular region is carried there by way of the phrenic, to the brachial and cervical plexuses, and from there thrown over into the interscapular region,—the region, possibly, of least resistance in the whole body.

A more direct route and through a more likely kind of nerve tissue, it seems to me, would be by way of the splanchnics. The efferent circulation through the greater splanchnic would reach the lower interscapular region (six to ten thoracic; scapula reaches seventh rib) and carried higher by way of connecting filaments (according to Dr. Beck) to the rest of the thoracic ganglia. The lesser and smallest communicate with each other, and also with the greater, so that they together would be able to drain the hepatic and renal region. According to Byron Robinson, the nerves are enormous in number in the peritoneum covering the gall-bladder. He also makes special mention of the profusion of Remak's nerve fibres in the kidney region. The intercommunication around the solar plexus would account for the gastric and intestinal disturbances found. Pain in inguinal, scrotal, or inner crural regions would come from the lumbar plexus, by way of the genitocrural and ilio-inguinal. The scrotal region might also get its pain from the spermatic (sympathetic).

While it is a slight divergence from the subject, yet it is interesting to note that the gall-bladder is an organ that seems to have evolved on account of the body's inability to consume the whole output of bile manufactured. Thereby is reserved a supply for a "rainy day," when the liver is not working. It is as logical to propose a reservoir for the salivary glands or pancreas, in fact, all the secretions that aid digestion, the same stimulation practically is given one as the other during the act of digestion. Then, again, the gall-bladder might be given credit for filling during the stage of stimulation of the liver and pouring out its fluid during the interim. There can be no claim made for actual necessity, however, for one finds

upon investigation that, according to Chauveau, some domesticated animals have no gall-bladder, the horse, for instance; and he rather leans towards the idea that the gall-bladder originated from a dilatation of the cystic duct, on account of the flow from the hepaticocystic duct to the ductus communis. While it is hard to comprehend why an ox should have a gall-bladder and a horse should have none, it is still harder to see how a deer can live without any excretory duct from the liver.

I had an opportunity, personally, to dissect a liver that I removed from a deer last January. There were no ducts to be found leading from the liver.

In the bird (pigeon) the arrangement of the excretory apparatus of the liver differs from the mammals, in that the cystic duct remains independent of the cholic duct by emptying below and behind the duodenal loop.

The kidneys and their excretory ducts are practically the same in the lower animal as in man.

Etiology of Stone Formation.—The proof seems positive that calculus formation in any of the mucous pouches is caused either by a stenosis causing insufficient drainage with a secondary invasion of pathogenic germ organisms, or from a primary bacterial infection (Charcot, Gambault, Ochsner, Niles, and others) and a secondary closure (partial) of the excretory ducts. The concentrated secretion, with a nucleus composed from bacteria and epithelium detritus, forms the stone.

Similarity of Symptoms.—Pain from either hepatic or renal calculi might be referred to almost any point, and would be merely a subjective sign of disturbance in that region. E. Owen, in speaking of the unreliability of pain says, "That the kidney draws its nerve supply blindfolded from the epigastric pool, and that it is small wonder, if in the absence of objective signs, that the patient and surgeon are sometimes led by the subjective symptoms to make serious mistakes." Jacobson explains pain in renal colic as frequently due to the passage of flatus in the colon. In that case the pain producing area would be the thickness of the duodenum, nearer the liver than the kidney.



FIG. 1.—Renal calculus.

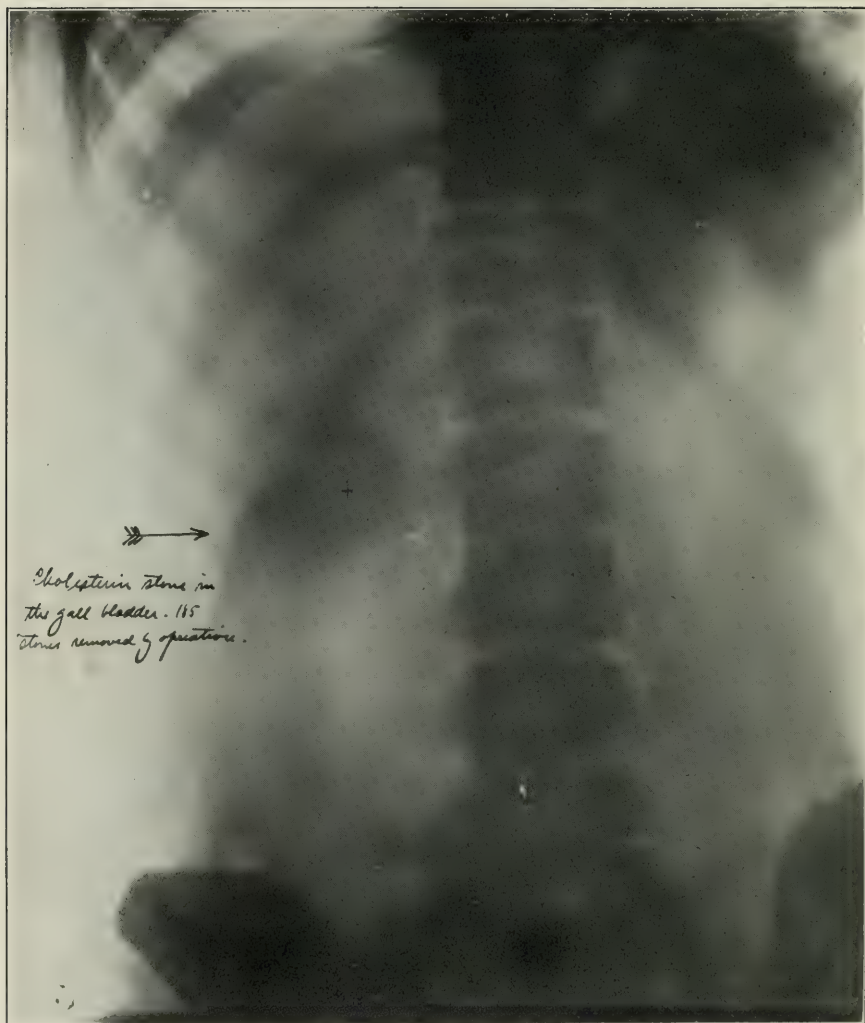


FIG. 2.—Gall-bladder calculus.

Hæmaturia, if present, is considered by some the sign most pathognomonic of renal calculi. Yet here one must differentiate from tubercular nephritis, passive and active congestion, which might be secondary to gall-stone, from granular kidney and sometimes from syphilis. Then, too, it would always be necessary to do a cystoscopy to exclude bladder and urethral bleeding.

Pyuria might result secondary to cholecystitis, cholangitis, duodenitis, colitis, pancreatitis, in fact, from any inflammation within or around about the kidney.

Nausea and vomiting are purely sympathetic symptoms; they can occur in both renal and hepatic calculi, and can also be absent in both.

Appendicitis can simulate both renal and hepatic calculi.

Icterus is a sign not to be depended upon, for it is present frequently outside of stone formation. The most marked case of jaundice I have ever seen occurred in a soldier, during the Spanish-American war, who had an enterocolitis complicated with nephritis; in fact, the major portion of the Northern soldiers were jaundiced on their return from the South.

Urine examinations throw but little light on the subject.

The X-ray in differential diagnosis is not so valuable in this region as elsewhere in the body, and unless stereoscopic skiagraphy can be perfected, sufficient to measure depth, there always will be a question in the mind of the operator. To illustrate this point I have two radiographs, both taken from living subjects,—one a renal stone, the other a hepatic calculi. Both shadows are directly opposite the lumbar vertebra and both shadows show in front of the right transverse process (Figs. 1 and 2).

In a female subject in which I had passed malleable wire sounds into the ductus communis choledochus, pancreatic duct, and the ureter, the radiograph shows the ends of the sounds directly opposite the second lumbar vertebra, leaving a space as large as a half-dollar, which would correspond to the kidney pelvis.

Behind this body, in order to test the density of the shadow

in the different kinds of renal calculi, four artificial renal stones were placed. The first was composed of calcium oxalate (which shows the dimmest); the second, uric acid; the third, triple phosphates (those two show about equal in density of shadow); the fourth was composed of all three combined, its shadow coming second in density. (Fig. 3.)

In another cadaver, also a female, mercury was injected into the gall-bladder, after ligating the terminal ducts, and a wire was passed from the urinary bladder up the ureter into the upper quadrant of the kidney pelvis. The radiograph shows the gall-bladder, from the weight of the mercury, hanging down below and to the right of the second lumbar vertebra. The sound is above and internal to the gall-bladder shadow. This demonstrates two especial facts,—a possible anomalous position of the gall-bladder when weighted down with stones and the near relation of the cystic duct, in this subject at least, with the upper portion of the pelvis of the kidney. (Fig. 4.)

Notwithstanding the advancement that medical science has attained to-day, it is in my opinion impossible, in some cases, to make a differential diagnosis between hepatic and renal calculi. So, in cases of doubt, it seems logical to cut down to the kidney first, and after that one can be governed by the findings he makes.

The following case is an illustration.

Mrs. K.; residence, Fort Wayne; aged forty-nine years; no children; family history good; father lived eighty years, great-grandfather ninety-six, mother still living, one of twelve children, all healthy except oldest brother, who has stomach trouble. Typhoid fever when twenty years of age. Never laced tightly. Disliked milk. Gives history of comparative health from typhoid fever to twelve years ago, at which time she had periodic attacks of colic, referred to the right lumbar region, which occurred about three times a year.

Two years ago I was first called to see her during one of these attacks. The following symptoms describe her succeeding attacks up to the time of operation: Intense pain in right lumbar region, interscapular region, and in right labium. No jaundice,

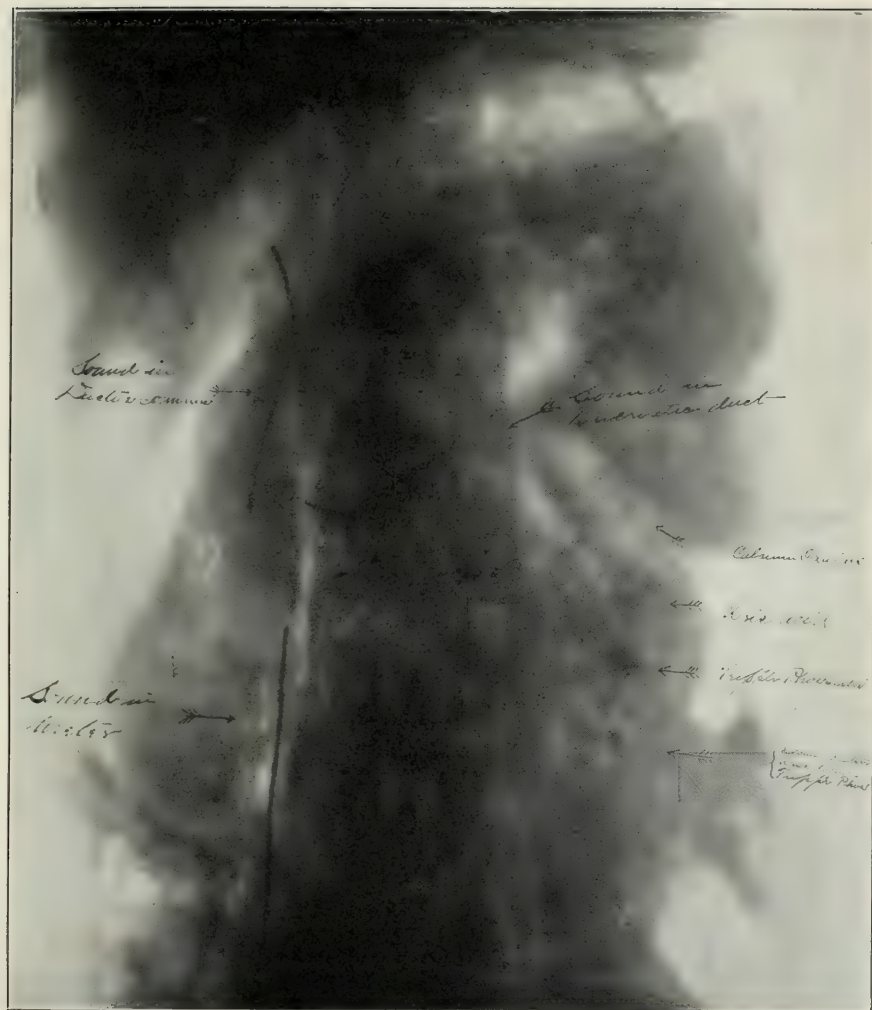


FIG. 3.—Skiagraph exhibiting shadows of wire sounds in common choledochus duct, pancreatic duct, and the ureter on right side; and of four artificial renal stones on the left side.



FIG. 4.—Skiagraph exhibiting gall-bladder filled with mercury, and ureter occupied by a wire sound.

no tympanites, until the following day; no nausea except that caused from the use of chloroform, which had to be used to control the pain. Examined faecal matter and urine repeatedly for stone without success. Operation advised, with a leaning towards renal rather than hepatic calculi as cause of trouble. Operation, April 9, 1902.

Nephrotomy; delivered kidney on back; needled same. During manipulation felt sac of stones inside peritoneal cavity. Replaced kidney. Closed lumbar wound. Opened abdomen in right rectus region. Delivered gall-bladder after breaking many adhesions. Closed belly up to gall-bladder. Cholecystotomy eight days later. Many stones removed. Seven stones found in stool after first operation. The interscapular pain was especially marked during the irrigations and dressings of the gall-bladder.

SOME POINTS IN LIGATION OF ARTERIES.¹

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I.

WHEN the writer graduated in medicine twenty-one years ago and for a good many years thereafter, it was the practically unanimous teaching of all the standard text-books that, in controlling any artery of importance, it was the surgeon's duty to tie so tightly as to rupture the innermost one, or even two, of the three tunics. He tried to use enough force to feel the divided tunics yield beneath his firm traction; the idea being that in a healthy artery the outer tunic is practically safe to withstand such force; and that the tunica intima and media, when ruptured, contract and retract into the remaining, unbroken tunic, and their curled-up, roughened ends were thought to invite prompt clotting and to safeguard against a secondary hæmorrhage.

The "surgeon's knot" was little advocated, excepting for suturing, at that period of surgical history. It was claimed, as against its use for ligating, that by kinking the double first turn prevented at times a tight enough constriction of the vessels to break the inner tunics.

As a consequence of experimental work from many sources, the present, modern views were evolved. "Ballance and Edmunds upon Arteries," "Senn's Experimental Surgery," and the works of Billroth and Esmarch may especially be mentioned in this regard. To-day nearly all standard text-books and teachers have reversed the rule mentioned above, and, recognizing that three tunics are stronger and safer than either two or one to meet a strain, they advocate tying so gently as

¹ Read before the New York Surgical Society, March 26, 1902.

just to stop the pulse, depending upon cellular activity in the arterial walls at and near the point of irritation to obliterate its lumen finally and permanently.

Among most surgeons, in this city at least, the friction knot is relied on for major work; and we doubt the accuracy of Ballance and Edmunds's assertion that the double first turn does not in the least prevent relaxation while tying the second half of this knot.

A few members of this society are committed in their writings to the opinion that the "stay knot," so named by Ballance and Edmunds, is best; but to-day few, if any, of us would advocate, as they do in their book, the use of dentists' floss silk for ligation instead of absorbable material.

In London, torsion is more used than perhaps is the case anywhere else. I have seen Mr. Bryant, after amputating the thigh, twist the femoral vessels, and rely upon this alone,—which probably none of us would be willing to do.

Presumably each of us formulates rules for his own guidance. In my own work I have made three classes, as follows: I twist all vessels so small that I do not know the name of the vessel in question. Surely one can trust torsion in small vessels; and thus we may avoid, for the great majority of our spurting arterioles, the risk of having foreign material of whatsoever sort left in the wound.

For vessels large enough to have a name I tie either "granny" or "reef," and tie *three times* instead of the usual two, just to take no possible chances with slippery, wet materials. And for arteries of the largest size, I use the "friction" knot, with No. 1 or No. 2 chromic catgut, but again add the third turn—just for the satisfaction of the added safety. Maybe this is unnecessary, but it is the kind of crankism from which nobody dies.

To discuss, now, the technique of control of the large vessels in a major amputation, which is the chief purpose of this paper. As to the largest, the dangerous vessels, the surgeon about to ligate is now between Scylla and Charybdis. If he sticks to the admitted principles of modern teaching, and ties

so gently as just to stop the bleeding, he runs a risk—a very real one—that the forcible impact of blood by its incessant pounding may succeed within a few hours in rolling or pushing that ligature off the end, on the face of the stump. If upon the other hand he ties so tightly as to avoid all risk of this, it is more than likely that he has ruptured the innermost tunics, and to that extent violated the rule as to what degree of tension is safest to prevent secondary hæmorrhage. In this dilemma every surgeon whom I personally have seen operate has taken the latter horn of the dilemma as being the lesser evil, and tied very tightly.

About a year ago I had this matter brought home to me forcibly from a wholly unexpected quarter. I had just completed my thirty-sixth extirpation of the external carotid, and had tied, gently as usual, and nearly two centimetres proximal to its end, the external carotid stump. It chanced that in this instance the superior thyroid was given off from the common carotid, and there was no side-branch between the ligature and the common carotid. This fact, plus an exceptionally vigorous heart-action, will explain the sequel. The patient had been returned to his bed, and I was about to leave the hospital, an hour after completing the operation, when an orderly called me back in utmost haste. I found a nurse compressing the upper end of the wound, where it seemed blood had suddenly gushed forth, without avail. Of course the pressure was transferred instantly to the right place, and the wound torn open by the fingers without a moment's delay. Then the position was plain. That hammering heart had rolled that ligature over and over perhaps a dozen times, until at last it was slipped off the arterial stump, when the spout of blood followed.

The patient was almost in collapse. Keeping my finger firmly upon the artery, I ordered him put in Trendelenburg's position by aid of a chair upside down upon the bed. Then with a tin funnel we poured into his anus about three quarts of very hot water from the tap, in which a handful of table salt was hastily dissolved. The result of this and hypodermic restorative means was excellent, his life being finally saved.

But assuredly he would have died had we waited to prepare and use intravenously a sterile salt solution.

Taught by this terrifying accident, the writer now uses in ligating the carotid end the same methods which he has employed for a good many years past in all amputations, namely, to stick to our modern principles and tie gently, but to do so *by the aid of a semicircular needle and holder*.

The following are the steps found reliable in my own work: Let us assume that we are doing an amputation in mid-leg, for example. The bones being sawed, there remain perhaps a dozen or more artery clamps upon the face of the stump. All of these we may twist or tie as we see fit, except the three main arteries. These, as our chief source of danger, need respectful attention. Each clamp is made to include in its bite the two veins with the artery, and these are gently drawn upon to make them tense, while with the semicircular needle armed with chromic catgut a purse-string suture is made to surround them. It enters and leaves the flesh not more than three or four times in completing the circle, and goes as close to the vascular sheath as seems wise, at a depth of say two centimetres from the clamped ends. Now the catgut is tied gently, using the first half of the friction knot; the ligature ends are caught together with an artery forceps, and the forceps upon these vessels' ends—the artery and its *venæ comites*—is removed.

This procedure is repeated upon each until the anterior tibial, posterior, and peroneal are all treated alike.

Next the tourniquet is removed; and now we can observe whether the three ligatures are tight enough.

If so, complete the friction knot; if, instead, some one of them bleeds a little, it is easy to tighten just enough the first half of the knot before completing it by making the second half.

By this technique it is plain that it is impossible for the blood to force a ligature off the vessel-end; and the writer is convinced that a gain in safety would be made if this plan were adopted as a regular procedure.

Some few surgeons use the plan of Dr. Senn, but I think not many, so far as inquiry has served. That is, a double ligature upon the arterial end, leaving a dead space between. As to this, if the vessel is tied so gently by both these ligatures, as it should be, as to avoid a likelihood of rupturing the tunics, I am unable to see that two ligatures would be a much greater protection than one against the danger of their being hammered by the blood-impact off the end of the artery.

II.

The second part of this essay has reference to the anatomical guides for the ligation of sundry arteries as laid down or recommended in the various text-books upon operative surgery.

In the course of sixteen years' experience as a teacher in this field, I have now demonstrated each of these ligations some hundreds of times upon the cadaver, plus a fair degree of experience in living surgery covering a much longer time. In the case of several among the more important arteries, I have gradually become convinced that rules simpler, and sometimes also better in accuracy, can be adopted than those ordinarily taught.

1. The first of these will be the superficial femoral at the so-called "point of election," ordinarily given as four and one-half inches down a line running from the middle of Poupart's ligament to the adductor tubercle upon the inner condyle of the femur.

This rule obviously has disadvantages,—three measurements must be taken in order to operate by it.

That which I would suggest, instead, is the following: In a full-sized man, the point of election will be found seven inches down a line taking the shortest possible course from the anterior superior iliac spine to the middle of the popliteal space. Reasons: (*a*) This rule involves but one measurement. (*b*) The tape-line lies upon the skin its entire distance. (*c*) It requires only measuring the hypotenuse of the tri-

angle described by Scarpa, instead of finding half of its base line and then bisecting the triangle, which is the customary way. It is a scalene triangle, and the hypotenuse is a very long one, which is why the seven-inch mark happens to be exactly the same as a four and one-half inch one by the usual rule.

I believe the common femoral has never been found bifurcating lower than four inches down the accustomed line; hence the reason for adopting heretofore a four-and-a-half-inch point of election.

2. Ligation of the superficial femoral in Hunter's canal, *i.e.*, at any point in the middle third of the thigh; there being no femoral artery in its lower third.

This is the ligation called by more than one of the text-books the "difficult ligation," to distinguish it from the one just mentioned at or about the apex of Scarpa's triangle. The only excuse for considering it difficult must be the fact that the vessel is here too deeply placed to permit of its pulsation being felt.

The rule which I would strongly recommend here enables the artery to be found as readily as the pulse at the wrist; and it is, I am convinced, the only way to make it so easy, namely, sharply to abduct the thigh and flex the leg, bringing the heel up against the perineum, or as nearly so as possible. An assistant also presses the knee downward towards the table. The limb is thus brought vigorously into the sartorial or tailor's position. In this position the adductor longus, one of the three sides of Hunter's canal, comes boldly up into relief as a firm, tense ridge. If now the incision be made lengthwise upon this ridge, and deepened along its upper surface, it will be wholly impossible to miss the artery.

The first muscle exposed in this incision will be the sartorius. It should be displaced upward (outward). It is recognized readily as being the only muscle upon the antero-internal surface of the thigh the fibres of which run downward and *inward*—all others here running downward and slightly *outward*; and again, the sartorius will be completely

relaxed and flabby in this position, while the adductor just beneath will be tensely rigid.

The roof of the canal, the fascia lata, is here transverse in the direction of its fibres. It is translucent, and through it we can clearly see the artery almost as readily as if through glass. Although in the accustomed position for ligation, the vein lies, in Hunter's canal, to the outer side of the artery, in *this* position now recommended the vein lies beneath the artery, very much as it is found in the ligation near the apex of Scarpa's triangle.

3. Ligation of the anterior tibial. The chief point worthy of mention here is one so striking as an anatomical fact that I am surprised that no work upon anatomy mentions it. Yet its accuracy as a fact I have demonstrated many dozens of times. I allude to the so-called "white line" between the tibialis anticus and the extensor longus digitorum. Whoever so named this must have been color-blind. It is a yellow line, —a line of fat between these muscles. When present it is an excellent guide; but in many cases, in the upper one-third to one-half of the leg, this yellow line is absent, or lost among the maze of vertical yellowish lines, a part of the deep fascia covering the muscles.

The curious fact is, that whether present or not in the upper part of the leg, this yellow line of guidance is *always* present in the lower half of the leg. It steadily broadens as it descends; and in the lower half is commonly at least as wide as a slate-pencil. Even in emaciated subjects in this lower region it will be found marked enough to serve as a guide.

In the lower ligation of this artery it lies between the same two muscles superficially; but upon separating them, cutting down through the yellow line aforesaid, we come upon a muscle not found in the upper ligation,—the extensor proprius hallicis.

Some twelve years ago, while teaching anatomy, it occurred to me that I never in my student days in Latin had come across any such nominative substantive as Hallux. Upon looking up the word, I found it in all works upon anatomy

and all medical dictionaries; evidently, however, copied from one to another, for it is not found in any Latin lexicon. There is, however, a Latin noun *Hallæx*, one meaning of which is the pollex pedis, or great toe. Evidently this, then, is the proper word; and we should say extensor proprius *hallicis* (not hallucis), and should speak of hallex valgus, not hallux valgus. I referred the question for an opinion to Professor H. T. Peck, Professor of Latin in Columbia University, and have his letter stating that the facts are as I have just given them. Not an important point, of course, but we may as well be accurate. Perhaps ligation or non-ligation of the anterior tibial artery has more of a historic than a vivid present interest to us. I know at least one competent historian—with Southern sympathies—who has always maintained that if this artery had not been shot through—and not ligated—in the person of that great leader, General Albert Sydney Johnston, at the battle of Shiloh, it might at that critical juncture have reversed the outcome of the war of the rebellion.

4. Ligation of the external carotid. Here, after an experience of between fifty and sixty ligations of this artery upon the living, as well as a few hundred already alluded to in operative surgery tuition, I would say that I feel certain that if we carry our incision much nearer the median line of the neck than is usually advised—fully three centimetres nearer—we will both facilitate finding the artery speedily and be working in a more safe region for opening up our landmarks. Danger here, as in ligation of the other two carotids, lies towards the outer side; safety, towards the median line of the neck. As to length of incision, it must of course vary greatly, but I make the hyoid bone the mid-point in the length of my cut for this ligation.

If anything at all has been made very plain by my recent work upon this vessel (Gross Prize work), it is that it is an exceedingly safe and simple ligation, and never yet have I seen a secondary hæmorrhage from it. It seems probable that hereafter as a matter of routine, prior to what would be a very bloody operation, inviting death from shock, therefore—such

as excision of the upper jaw, as a single instance among many—surgeons will tie both external carotids as the first step of the operation. This does not in my experience occupy more than three to five minutes for each ligation; and thereafter the operation will be almost as bloodless as if upon a cadaver.

5. To approach the vertebral in the usual way is to enter the neck as low as possible, partly detaching the sternomastoid from its bony attachments, either behind or in front, in order to get room to work in a region full of jeopardy to life. For in close proximity to the vertebral in this region lie the phrenic and sympathetic nerves, the deep jugular vein, the pleura, the thoracic duct (on the left), the inferior thyroid vessels, etc.

This ligation really deserves its name of being one of the most dangerous. But all this risk is wholly unnecessary, except when the arterial ends must be found and secured in this region, to control hæmorrhage from a wound of it. If, however, the ligation is in continuity, all this risk is wholly unnecessary. The vertebral artery can be controlled almost as easily and safely as the pulse at the wrist. The incision should be identical with that used for ligating the common carotid at the "point of election," and should be deepened exactly as if that carotid were the object of our work. With a blunt retractor, the common carotid, its accompanying nerve and vein are drawn towards the outer side, leaving room for our work upon the vertebral.

Chassaignac's tubercle is now located about one centimetre, on an average, above the level of the cricoid cartilage of the larynx. Just within this is the foramen in the same, the *sixth* vertebra, which the vertebral artery first enters. It is only a trifling matter to divide the longus colli transversely, just below Chassaignac's tubercle, to come down upon the vertebral artery in a very safe region, and tie it. Nothing at all would be gained by ligating in a region at once lower in the neck and more dangerous, because this artery does not give off any of its branches until after it enters the foramen in question.

6. Ligation of the third portion of the subclavian artery.

A very few text-books mention, but most do not, the method of ligation of this artery which seems to me distinctly easier and safer than the one usually adopted; by which is meant the incision parallel to and just *below* the middle third of the clavicle instead of one just *above* that middle third.

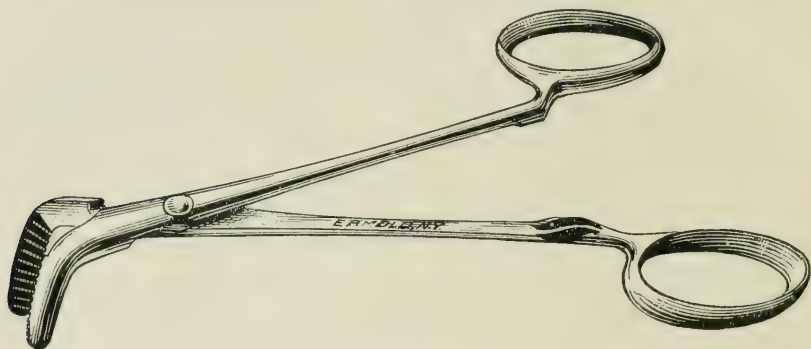
Having tied both ways upon the same subject many times,—*above* upon one side, *below* upon the other side,—I am convinced that the latter plan is the best. But to carry it out properly, it is just as essential to have the shoulder raised as far as possible,—using the arm as a tractor,—as it is essential in trying above the collar-bone to force down the shoulder by the same means. In either case a gain in space for work of fully three centimetres results, and sometimes even more. Below the bone the relationship is in order from within outward, vein, artery, nerves. The latter, the brachial plexus, are in a close bundle, and need not be disturbed. They are first exposed, and the artery is found about one centimetre inward from them. This vessel also lies about two to three centimetres outward from the coracoid process. The vein,, as in the ligation above the bone, need not be seen, as a rule. After ligation, the cut fibres of the pectoralis major and sometimes of the deltoid must be sutured, of course. This incision, below the bone, is of obvious safety in case the wound suppurates. The upper ligation drains badly; this one drains very well. The lower cut also avoids having to divide the external jugular vein, and prevents all trouble with either the transversalis colli or the suprascapular vessels. Occasionally a supernumerary cervical rib gets in the way by the upper route. Upon the right side, in the usual incision, the deep jugular vein is in some little danger, and has been wounded. This is true, too, in a few instances, as to the phrenic nerve. Plainly, these risks are all non-existent in the lower incision.

Apparently, the one and only reason why the ligation through a cut below the clavicle has not long ago become the standard one is, the neglect to *elevate the shoulder* as the first step, and thereby to drag the collar-bone up out of the way. It is a fact that in the lower operation the point at which the

third portion of the subclavian is ligated is identical with the spot at which it is tied when reached through the more customary incision, *i.e.*, by the upper route, with the shoulder sharply depressed.

III.

The instrument which I call a ligation forceps is a very simple modification of the ordinary Wells' hæmostat, the jaws



Ligation forceps.

being turned nearly at a right-angle with the handle. This instrument I have used for many years. In excising forty-two external carotids upon the living subject I have necessarily had to tie in continuity and divide more than 250 branches, in addition to the main trunks; and have used this ligation forceps for all such work.

As compared with either the aneurism needle or a probe, this tool is blunter, and consequently is safer, being less likely to pierce a thin-walled accompanying vein.

After gently working its blunt point around the artery, the jaws are opened and the catgut end seized and withdrawn, after which it is used as a tractor until the knot is tied.

I would beg to commend this little tool to the goodwill of surgeons, believing that, when better known for this use, it will be considered the instrument of choice in all ligations in continuity.

A CASE OF TUBERCULOSIS, RESEMBLING CARCINOMA, IN THE TONGUE OF AN OLD MAN.

BY L. B. ZINTSMaster, M.D.,

OF CLEVELAND, OHIO,

Senior Interne, Lakeside Hospital.

THE following case was treated in the surgical service of Dr. Dudley P. Allen, Lakeside Hospital.

Mr. A. W., aged eighty years, farmer by occupation, came to the hospital, March 5, 1901. He complained of the following symptoms:

Three months ago there appeared on the tip of his tongue a small ulcer. The ulcer gradually increased in size and became more and more painful. On inspection, there was seen on the tip of the tongue, and slightly to the left side, a superficial ulcer about one centimetre in diameter and the same in depth. The margins of the ulcer were fairly smooth, the base was studded with little irregular elevations, yellowish gray in color. The base of the ulcer was indurated, its surface was ragged, and it emitted an offensive odor. On general physical examination nothing abnormal was found except the ordinary changes incident to age, and the patient's condition was excellent considering his advanced age. There was no palpable enlargement of the submaxillary lymph glands. The patient said that his general health had always been good, and he gave no family history of tuberculosis or malignant growths.

A diagnosis of carcinoma linguæ was made, and the removal of the ulcerated surface and its indurated base was advised.

On account of the age of the patient, it did not seem desirable to subject him to prolonged anæsthesia, so he was given ether rapidly, and before the stage of excitation was reached the tip of the tongue was seized with forceps, drawn outward, and a wedge-shaped piece of the tongue including the ulcer was rapidly excised. The incision was closed with interrupted silkworm-gut sutures.

The patient endured the operation well, and the wound healed by first intention. After leaving the hospital, the patient returned

several times, complaining of pain. The wound, however, seemed entirely healed.

The patient's physician, Dr. George Lathrop, of Dover, Ohio, reports that the tongue remained entirely healed until September 1, 1901, when a return of the ulcer was noticed on the tongue. This was followed by ulceration on the upper jaw on the left side. Later there was ulceration of the upper jaw on the right side and ulceration of the soft palate, which gradually extended up on the vault of the mouth. The patient's strength gradually decreased. He lost his appetite and took very little nourishment. Two weeks before death, the patient became hoarse, and found swallowing difficult. There was no development of tuberculosis in the lungs or elsewhere. The patient died December 15, 1901.

Pathological Report.—I am indebted to Dr. W. T. Howard, Jr., for reviewing the following report:

Sections made from the part of the tongue removed and through the ulcer and tissues adjoining included a mucous membrane covered with a layer of flat epithelial cells, a submucosa, and striated muscle tissue containing simple tubular glands and a large number of miliary tubercles. The ulcer had a ragged edge and extended through the mucous membrane and submucosa into the muscular tissue. The tissue just beneath this edge was composed mostly of small round cells having round nuclei with a small amount of faintly staining protoplasm. There was a small amount of homogeneous, intercellular tissue which was faintly stained with eosin. Farther from the surface there were a few scattered connective-tissue fibres and a greater number of small round cells. Below this there was muscle tissue which was infiltrated with a larger or smaller number of small round cells. The mucosa adjoining the ulcer was necrotic, and did not take the stain well.

The submucosa was somewhat infiltrated with lymphocytes. The connective-tissue fibres were indistinct and did not take the stain well. Scattered irregularly throughout the muscular tissue there were a large number of miliary tubercles. A typical one of these presented the following appearance: Rounded in outline, the extreme outer border being composed of a few faintly stained connective-tissue fibres. The greater part of the tubercle was composed of pale, necrotic material which had in it many small round cells, the greater number being around the periphery, where there were also a few larger cells, oblong in form with large nuclei, the

so-called epithelioid cells. The typical tubercle described had in it four giant cells. One was quite large and almost circular in form. Around the border were a large number of rounded nuclei. The centre was composed of pale, homogeneous material. The other giant cells in this tubercle were smaller, had fewer nuclei, and were irregular in outline.

The tissue was hardened in Orth's solution, and the sections were stained with hæmotoxylin and eosin. Sections stained for tubercle bacilli gave a negative result.

In comparing this case with a considerable number of others of tuberculosis of the tongue which have been reported, the most striking feature is the development of tuberculosis at the advanced age of eighty years. The usual time for the appearance of this disease in the reports of cases reviewed being all before or about middle age of life.

Another striking feature is that the ulcerated mass on the tongue presented the appearance of carcinoma rather than tuberculosis.

A third factor of importance is that the patient was apparently more than ordinarily robust for his age, and that he manifested no other evidence of tuberculosis.

In the cases reviewed, very few were found in which the tubercular ulceration did not come on secondarily to tuberculosis of the throat or lungs.

In tuberculosis of the tongue, it is quite the usual thing for the submaxillary lymph glands to be enlarged, and in some cases go on to caseation. In this case the glands were apparently normal.

PERSISTENT THYROLINGUAL DUCT; COMPLETE BRANCHIAL FISTULA.¹

WITH NOTE ON THE TEACHING OF EMBRYOLOGY BY MEANS OF CLAY MODELS.

BY HORACE J. WHITACRE, M.D.,

OF CINCINNATI,

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IN the present communication I wish to report two unusual cases of cervical fistula, and in connection therewith to call attention to a method of teaching embryology which I have used with satisfaction to myself and profit to my students during the past three years.

CASE I.—*Complete Branchial Fistula*.—I. R., aged five years. Family history good, except for petit mal in a brother who is seven years of age. A few weeks after birth, the mother noticed a small lump surmounted by a pin-sized opening on the right side of the neck, two centimetres above and to the right of the sternoclavicular articulation. A small amount of clear, sticky fluid exuded periodically from this opening. This condition has persisted until the present time without giving her much trouble. The secretion periodically dries on the skin surface and plugs the opening; the sac fills with the accumulated secretion; then washing or other mechanical means, sometimes the pressure of the retained fluid, removes the crust, and a considerable amount of this clear, stringy fluid escapes. The mother states similar material has been repeatedly and sometimes continuously expectorated at those times when the external discharge was slight. I was called to see the child because the swelling in the neck had become much larger than ever before and very much inflamed. The small orifice of the sinus was dilated by inserting a narrow-blade forceps and separating the blades. A small amount of mucopurulent material was liberated. On probing the sinus I found that it extended deeply, but was compelled to desist because of the violent coughing which was excited. The cause

¹ Read before the Cincinnati Academy of Medicine.



FIG. 1.—Complete branchial fistula of neck. *a* represents the site of the external opening of the fistula; *b*, a perpendicular line drawn over the centre of the sternum; *c*, an oblique line traced over the most prominent part of the clavicle.

of this coughing was at once demonstrated by the expectoration of a considerable amount of blood. It was at once evident that I was dealing with a complete branchial fistula (Fig. 1), and that I had the equivalent of a demonstration of this fact by the injection of a bitter or a colored fluid into the outer opening. An examination of the throat revealed the bleeding internal end of the fistula in the lower border of the right tonsil.

Operation.—The outer orifice of the fistula was removed with an elliptical piece of skin, and the incision extended upward along

FIG. 2.



Complete branchial fistula. The complete fistulous tract after its removal. The lower end was attached to the skin, and the upper end communicated with the throat in the tonsil.

the anterior border of the sternomastoid. The narrow, external opening widened out immediately into a large sac, the lower diverticulum of which extended down to or somewhat under the upper border of the clavicle. A minute dissection with a sharp knife was made, and this dilatation was soon found to narrow down like a cone as it was followed upward anterior to the sheath of the carotid artery and jugular vein. At the level of the upper border of the thyroid cartilage the sinus had diminished to the size of a hair, and would scarcely admit a fine probe. The course of the sinus was very deep at this point, and the dissection led

to the lower border of the tonsil, as had been demonstrated by the escape of blood at this point. The sinus was snipped off in the tonsil and removed intact as one continuous trumpet-shaped tube which had extended from the sternoclavicular articulation to the right tonsil. A photograph of the specimen is presented in Fig. 2. Healing after operation was perfect, and there has been no recurrence of a fistula.

CASE II.—*Fistula from a Persistent Thyrolingual Duct.*—H. M., aged eighteen years, male, white, not married. Family history negative, personal history of children's diseases. Two and one-half years before he first consulted me, the patient had noticed a small swelling the size of a pea on the left side of the thyroid cartilage and about its middle. This swelling increased rapidly in size for one week, until it became one-half an inch in diameter, then broke spontaneously, and discharged about one-half teaspoonful of bloody fluid. This swelling was accompanied by redness, but no pain. In one week's time the discharge continued but was mucous in character. A discharging fistula has persisted for the entire period of two and a half years. During this time the outer opening has repeatedly crusted over for a few days, then, with the friction of washing, the crust would be removed and the same stringy mucus would escape. His family physician has repeatedly slit up the sinus tract, with no improvement. Dr. Thorner curetted the fistula, but it was not cured. When I first saw the patient, the entire lesion consisted in a minute fistulous opening over the middle of the left thyroid cartilage. This fistula discharged two or three drops per day of an opalescent, stringy mucus. A probe could be passed only one-fourth of an inch upward in the direction of the body of the hyoid bone.

Operation.—The fistulous tract was followed up to the body of the hyoid bone and excised intact. A sinus persisted over hyoid. At the second operation, a side branch was discovered which led upward to the left side of the neck for a distance of two inches. This projection ended near the apex of the styloid process of the temporal bone. This operation was considered to be final, but the sinus persisted over the hyoid. A third operation, done in consultation with Dr. P. S. Conner, revealed a second projection, which followed the direction of the foetal thyrolingual duct from the foramen cæcum to the body of the hyoid bone.

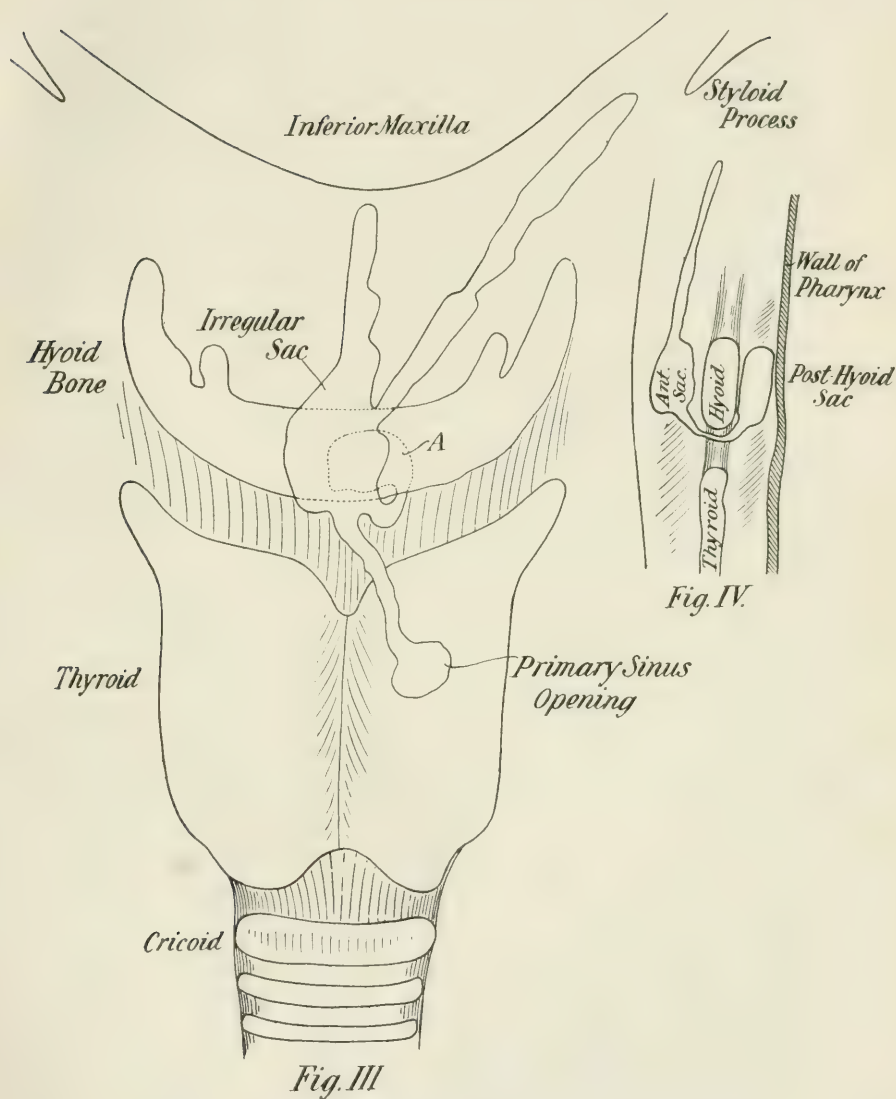


FIG. 3 shows in a rough way the anatomical position of the various ramifications of the epithelial-lined tracts found in Case II. The dotted line at *A* represents the posthyoid sac which communicates with the remainder by a narrow neck below the hyoid bone.

FIG. 4 shows a median sagittal section, and gives the relations of the two sacs to the hyoid bone.

This duct was cleanly removed, but the sinus persisted after operation. At a fourth operation, a clean anatomical dissection was made of this entire region, and, to complete this thoroughness of dissection, the body of the hyoid bone was cut away. Here was found the cause of the last failure. A sac the size of a pea was disclosed, and pressure on this sac caused the typical whitish fluid to exude from an opening at the lower border of the bone, which was so fine that no probe could enter it, and certainly no eye could see it. This sac was excised. The result of this operation was the complete cure of the fistula, and there has been no recurrence during the three years that have intervened since this last operation.

This case presents some difficult embryologic problems, and at the same time illustrates the difficulties in the complete extirpation of some of these cysts, together with the certain failure to cure the conditions so long as the least remnant of such *epithelial-lined* fistula remains behind. The side tracts in this case were not carelessly overlooked, but the openings into them from the main sac were so minute that no probe could enter them and no eye could detect them in a wound. Colored materials were injected, but gave no help. The only guide was the thin sac wall, and this narrowed down to such a small neck that the question constantly arose as to whether we were dealing with a connective-tissue band or an isthmus between two sacs. The fistulous tracts, dissected out at the time of each operation, were demonstrated by microscopic examination to be lined by epithelium. The median tract running from the body of the hyoid bone to the floor of the mouth as well as the small sac behind the hyoid bone can readily be explained, since they occupy the position of the foetal thyro-lingual duct. The tract leading downward and to the left as far as the middle of the thyroid cartilage on this side, where the external opening was primarily found, must be explained either as an extension downward from the median line by suppuration or as an unusual anomaly in development. The tract leading from the body of the hyoid bone upward to the apex of the styloid process of the left temporal bone is not

easy to explain. It is possible that it represents an incompletely closed second cleft. That is, the tonsillar end had closed, also the sinus precervicalis had closed over on the neck surface, and a completely closed epithelial-lined tract resulted. In what way this tract became connected with the median thyrolingual duct I am unable to explain embryologically; indeed, I am not certain that it did communicate before my first operation. It is possible that during the dissection of the first operation this closed canal was incised, and that at the time of the second operation this newly opened tract appeared to open into the same cavity as the posthyoid cyst.

In a second case of persistent thyrolingual duct or of cyst resulting from such foetal remnant, I think that I would explore the posthyoid region as a routine part of the dissection.

THE TEACHING OF EMBRYOLOGY BY MEANS OF CLAY MODELS.

Inasmuch as the explanation of the two cases reported is to be found in a defective embryologic development, I have considered that it would be profitable to demonstrate in clay first the complicated process of development in the neck region, then the manner in which these developmental processes may go wrong and result in the two varieties of fistula that are reported.

The method of teaching embryology by means of clay modelling, conducted before a class, was suggested to me, *first*, by my own total inability, as a student, to understand embryology from drawings, pictures, and sections; and, *second*, by the great aid given by reconstructing the embryo in wax from microscopic sections. Three dimensions are certainly essential to a complete understanding of the complicated process of development, and I believe that my students get a more complete memory picture of developmental processes by this method of teaching than by any other. Furthermore, the teacher's burden is much lessened. It is a comparatively simple matter to demonstrate by means of clay how a

flat disk may become a tube; how a groove may appear here a fold or a bud, or a thickening or a thinning there, and so on until every detail of the completed structure has been built up.

The materials needed are 100 pounds of modelling clay such as artists use, a few wooden spatulas, ten pounds of thin sheet-lead cut in strips one inch wide, and two or three colors of flannel. A large shield-shaped piece of clay will represent the mesoblast, a sheet of red flannel over its upper surface the epiblast, and a sheet of blue flannel on its under surface the hypoblast. The epi- and hypoblast continue for the most part as single or as very thin layers of epithelial cells to the full term of development. The flannel can therefore be used throughout to represent these layers. The complicated developmental processes occur almost entirely in the mesoblast, and a clay of proper consistency can be modelled to represent every stage, while the two layers of flannel will be made to follow every variation in the contour of the clay. The development of the brain from the epiblast will of course be conducted in clay as a separate model, as will likewise the eye, the ear, etc.

The following conclusions drawn from such embryologic study bear directly upon the two cases reported:

(1) That the mesoblast in the neck region undergoes complete circular segmentation to form five so-called branchial arches, and that between these arches there are deep fissures, both on the inner and on the outer surface, which are separated from each other only by a double layer of epithelium (the epi- and the hypoblast).

(2) That a persistence of these clefts may form a blind external or a blind internal pocket, and that a breaking through of the separating membrane will form a free communication between the skin surface of the neck and the throat.

(3) That the first cleft maintains its foetal arrangement and forms the auditory canal. The double layer of epithelium forms the ear-drum. This cleft cannot therefore form a branchial fistula.

(4) That the second cleft has its inner opening in the region of the tonsil.

(5) That the outer surface of the neck becomes so flexed that a pit forms (the sinus precervicalis). The bottom of this is formed by the third, fourth, and fifth branchial arches and the second, third, and fourth clefts. This pit gradually closes over the top even with the body surface and buries the original clefts. It is therefore apparent that a complete failure in the closure of the second, third, or fourth cleft would result in a tract leading from the throat into this pit, and that a complete branchial fistula, as in Case I, must be the result of an additional fistula connecting the skin surface with the pit, *i.e.*, a failure of the pit to close completely. (In Case I the lower opening and fistula represent the opening into the pit; the large dilatation represents the pit, and the narrow channel leading up to the tonsil the branchial cleft.)

(6) The defect in the outer wall of this pit may be at any point on the side of the neck, from the angle of the jaw to the clavicle, from the median line to the posterior border of the sternomastoid.

(7) The third cleft never forms a fistula.

(8) The fourth cleft never forms a fistula.

(9) The second branchial cleft is the one that invariably gives rise to these fistulæ, and while the outer opening of such a fistula may be anywhere on the side of the neck, the inner opening is always in the region of the tonsil, the primitive position of the second inner cleft.

(10) Fistulæ never open into the larynx or trachea because the respiratory bud comes off below the branchial arches and clefts.

(11) Median branchial fistulæ do not exist. The outer opening may be in the median line, but the tract soon deviates to one or the other side.

(12) The thyrolingual duct may give rise to fistulæ and cysts, and these must of necessity be situated in the median line and either below the hyoid bone, behind the hyoid bone just above the hyoid bone, or in the floor of the mouth.

To this may be appended a few clinical conclusions:

(1) Branchial fistulæ usually manifest themselves before

the age of twenty, but may not appear before the age of forty-five or fifty-seven, as has occurred in reported cases.

(2) Embryonal defects are often hereditary. One observer reports five cases occurring in one family; another, the occurrence of the same condition in brothers.

(3) A very large proportion of branchial fistulæ are complete, but are not recognized as such because the tortuous nature of the sinus baffles probing. The injections of a bitter fluid which the patient may taste, or the use of colored fluids which may be seen, will aid much in establishing this point.

(4) The secretion is usually slight and mucous in character, or opalescent and sticky, and contains epithelial cells.

(5) The size of the outer opening is no guide to the size of the sinus, but a small skin opening often indicates a large cavity underneath.

(6) The wall of the sinus is usually made up of fibrous connective tissue.

(7) The interior of these sinuses or cysts is invariably lined by flat or ciliated columnar epithelium. In the complete fistulæ the upper half of the sinus is often covered by ciliated epithelium.

(8) The only rational treatment is complete excision of all epithelial covered surfaces.

(9) The failure to remove all epithelial covered surfaces will certainly be followed by a persistence of the fistula.

CYSTS IN CONNECTION WITH THE TEETH.¹

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THE teeth, particularly unerupted ones, have for years been recognized as etiological factors in the production of neoplasms affecting either the upper or lower jaw, but, in spite of this fact, little attention has been given to the subject by writers upon surgical topics. This lack of literature has perhaps led to misapprehensions regarding diagnosis and treatment, and conservative methods which would result in benefit to the patient have too often given place to uncalled-for radical operations obviously detrimental to the comfort and appearance of the patient.

CASE I.—The first case that attracted my attention particularly to this subject was that of J. W., a young man twenty-five years of age. He had had a persistent sinus in the region of the left upper first bicuspid tooth for nine years. He had been operated upon several times for alveolar necrosis, but without benefit. The continued suppuration and accompanying odor distressed the patient beyond measure. He had about made up his mind to adopt the suggestion of one of his physicians, *i.e.*, have excision of the superior maxilla made.

When examined, October 11, 1898, a very considerable thickening and hardening of the maxilla existed in the alveolus between the left lateral incisor and the first molar of the upper jaw. The canine and both bicuspid teeth were absent. The second bicuspid and the canine had been extracted, but no history of the first permanent bicuspid could be obtained. He thought it had never been present. A large mass of very hard bone, presenting a worm-eaten appearance, projected beyond the gum in the space

¹ Read before the American Surgical Association, June 5, 1902.

mentioned above. A sinus existed at the anterior part, that is, in the region of the socket of the canine tooth. A probe could be inserted into this sinus for one and one-half inches. The probe also showed that the area of necrotic bone was limited for the most part to the superficial portion of the alveolar ridge, and that the body of the bone was not involved. A sinus also opened through the lateral wall of the left nasal fossa. A probe introduced through the sinus in the mouth could be brought into contact with one passed through the lateral wall of the nose. The sinus opening into the nose passed through the bony structures. There was a localized tender area of fulness just below the inner half of the floor of the orbit.

The patient was free from syphilitic taint, and he had no recollection of any injury to his jaw or face.

The sinuses were reamed out by means of a small, sharp spoon. They led to the point on the anterior surface of the superior maxilla indicated by the area of fulness and tenderness above referred to. A bicuspid tooth (Fig. 1), perfect as to crown but with imperfect roots, was found at the bottom of the sinuses embedded in the superior maxilla, but anterior to the maxillary sinus. After its removal the parts were thoroughly curetted. The after-history is that of rapid closure of the sinuses and cessation of suppuration.

CASE II.—M. B., aged ten years. An attempt to extract a tooth two and a half years before resulted in the right, lower, lateral incisor being broken off. A short time afterwards a painful swelling made its appearance on the alveolar border just to the right of the central incisor. This enlargement was very painful for a time, but this feature soon disappeared. The augmentation of the growth was very gradual.

Examination of the case in May, 1901, revealed a dense fluctuating tumor, bluish in color, with tortuous vessels coursing over it. The alveolar edges had been forced apart by the growth and absorption of the inner wall had progressed so far as to permit the mass to project under the mucous membrane in the floor of the mouth. The mass was not tender. Fluctuation was evident, the sensation being that of a tense capsule containing fluid. No "crackling" could be elicited by pressure.

An incision under chloroform was made June 4, 1901, at the Presbyterian Hospital. This permitted the fluid to escape, and

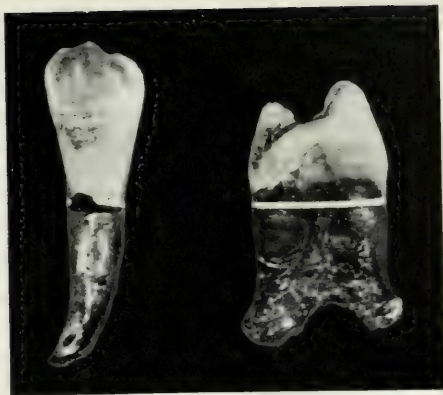


FIG. 1 shows teeth removed from the interior of these cysts. They show a perfect condition of the enamel and crown of the tooth, but imperfect roots.

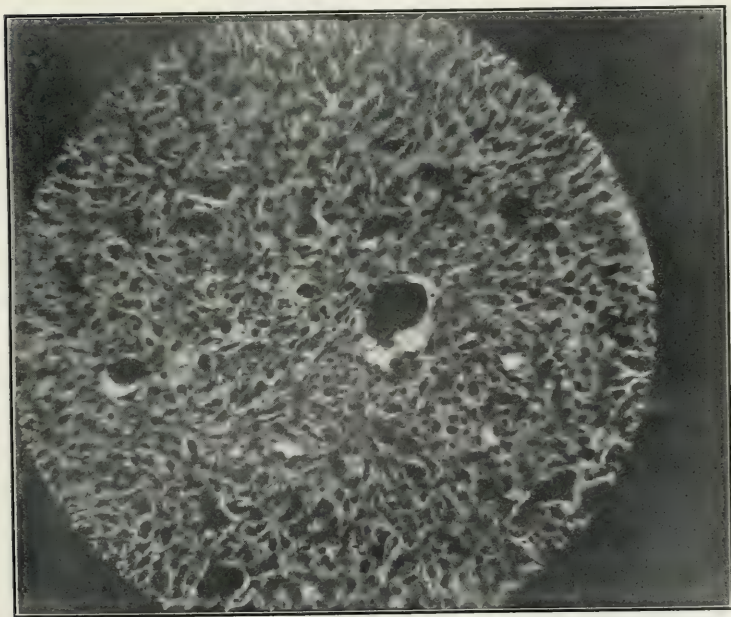


FIG. 2 is a photomicrograph of the giant-celled structure from the wall of the cyst in Case II.

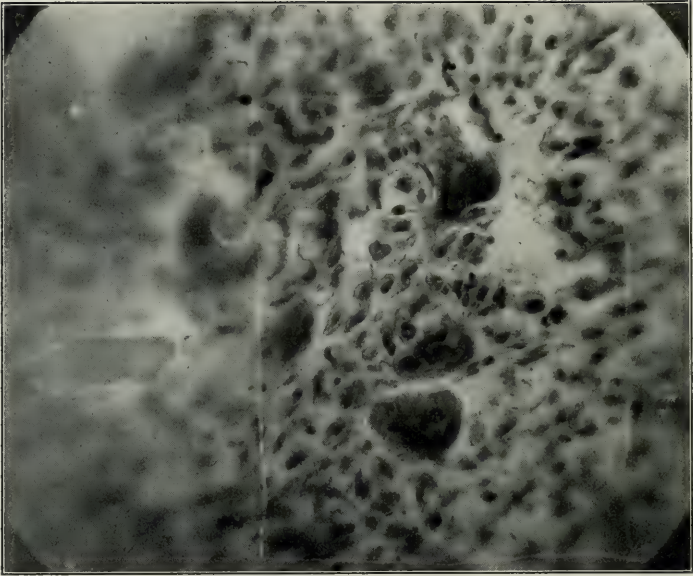


FIG. 3 is a section from the interior of the cyst in Case III.

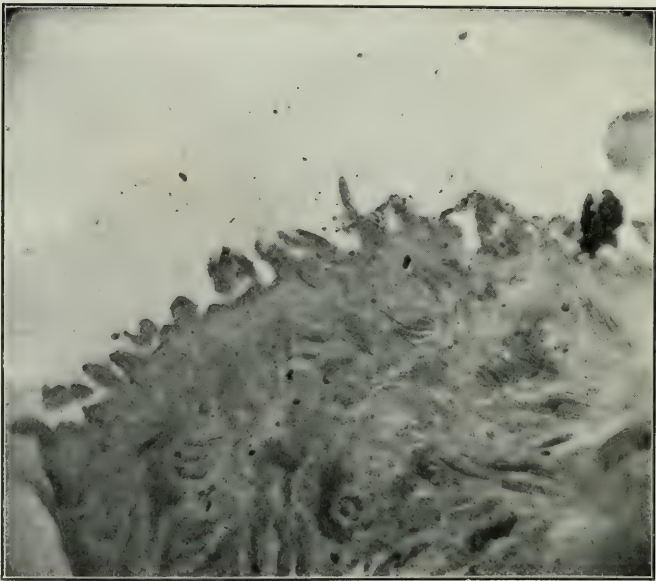


FIG. 4 is from the inner wall of the cyst in Case III. This was removed at the second operation. It shows the fingers of the granulation tissue.

exposed a reticulated interior,—bony spiculæ were found in the partitions. A permanent incisor (Fig. 1) and canine tooth were found within the sac. Their roots were directed obliquely outward and downward, the crowns projecting inward and upward. The cyst wall extended backward to the proximal surface of the first bicuspid tooth. (The curetting so loosened this as to demand its removal.) A careful examination showed that the cyst extended to the neck of the teeth. It did not extend downward upon the roots.

The cavity rapidly contracted and healed under gauze packing and antiseptic washes. The patient has remained well.

Microscopic examination of sections of the cyst disclosed a typical picture of myeloid sarcoma. (Fig. 2.)

CASE III.—(Notes and microscopic sections furnished by H. J. Whitacre, M.D., in whose practice the case occurred.)—E. H., aged twelve years, had a family history of tuberculosis. The patient had been a delicate child. Nine months previous to coming under Dr. Whitacre's observation the patient suffered much pain in the molar teeth on the left side of the lower jaw. The permanent teeth, with the exception of the molars, bicuspid, and canine on the left side of the lower jaw, were erupted. These teeth failed to appear, but the gum in the region of the molars increased progressively in size until (May 22, 1900) a tumor the size of an English walnut had formed. Dr. N. P. Dandridge operated upon this growth. He removed the mass and some buried teeth. Sections of this growth led the microscopist to the opinion that it was a giant-celled sarcoma. (Fig. 3.)

At a later date, seven weeks before coming under Dr. Whitacre's care, a tumefaction made its appearance in the region of the canine tooth on the same side of the mandible. The left permanent canine was absent, but its fellow on the opposite side had erupted twelve months previously.

The swelling referred to above was firm. It was located upon the inner side of the lower jaw, extending from the mid-line to the position of the second bicuspid tooth in its long diameter and from the upper to the lower border of the bone. The tumor was about the shape and size of a pigeon egg bisected longitudinally. The bone was much thickened. The swelling was covered by normal mucosa, was not sensitive, and was very firmly

attached. There was no enlargement of the cervical lymphatic glands.

In view of the apparent recurrence after the previous operation, the diagnosis was in doubt until an incision revealed a cyst containing a small amount of fluid and a canine tooth. The tooth projected inward and upward into the cyst cavity. Its crown was well formed and projected into the cyst to about the same extent that the normal teeth protrude beyond the gum. The root of the tooth seemed to be well formed. The patient recovered rapidly from the condition and has remained well.

Sections of the mass showed granulation tissue with inflammatory papillæ dipping into the interior of the cyst. (Fig. 4.) It did not resemble the tissue removed at the previous operation.

The history of this class of cases practically began with Christopher Heath's series of masterly articles on the subject published in the *British Medical Journal* for 1883. These articles were subsequently published in book form under the caption of "Injuries and Diseases of the Jaws." The author mentions the fact that isolated examples of the affection had been published by Fergusson and others, but he calls attention to the meagreness of the literature upon the subject.

Dr. W. P. Bolles contributed a most complete article upon this affection to the *Boston Medical and Surgical Journal*, September 7, 1871. He may therefore be considered a pioneer in the attempt to elucidate the problems connected with dentary cysts. His observations were confined to cystic growths.

Sir John Tomes ("A System of Dental Surgery," 1887) was an early and intelligent contributor to the literature.

A proper conception of the pathology of these cysts is unattainable without a careful consideration of the developmental period of the teeth. In one respect embryology seems to cast much doubt upon the ordinary conception of the pathology and pathological anatomy of these growths. (Fig. 5.) Investigations regarding the developmental period show that one part of the teeth, the enamel, is a direct derivative of the overlying ectodermic epithelium, while the pulp, dentine, and cementum are derived from the mesoderm. In the sixth week

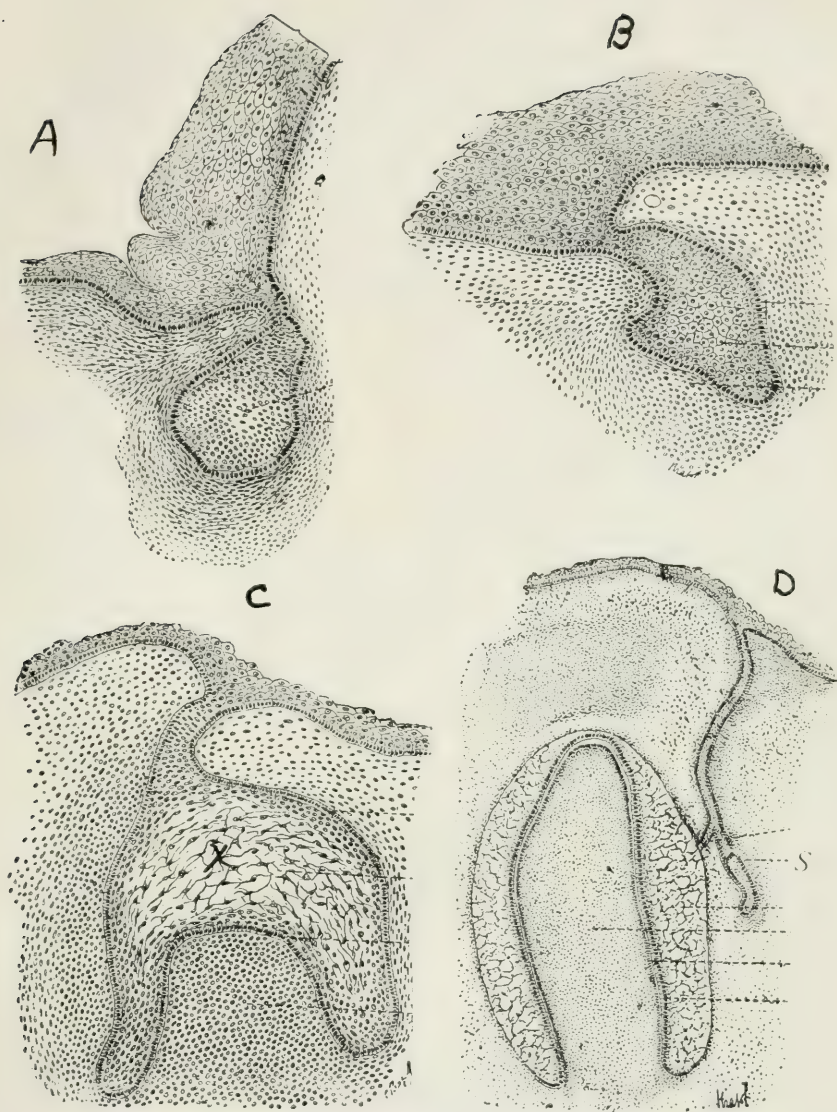


FIG. 5.—Diagram taken from Böhm-Davidhoff's text-book of histology. *A* and *B* show the enamel shelf from which the enamel organ develops downward and backward. *C* shows the papilla pushing up into the enamel organ, a mesoblastic structure, and, in addition, shows the liquefaction process at *X*. *D* shows the further development of the papilla, which now takes the form of a tooth. At *S* the epithelial bud has appeared that is to form the permanent tooth.

of intra-uterine life the epithelial cells upon the surface of the gums multiply and grow downward into the subjacent mesodermic layer in an oblique direction towards the lingual surface of the gum. This ingrowing epithelial (dental) shelf divides into ten indentations, which become the enamel sacs or primitive enamel germs, the enamel of the teeth being derived from them. (Figs. 6, 7, and 8.) The cells between the individual enamel germs disappear, and thus the germs become separated from each other and from the epithelial cells of the surface. In this manner they become true epithelial implantations. Conical projections (dental papillæ) are sent up from the mesodermic layer, one for each enamel organ. (Fig. 9.) These projections are the forerunners of the dentine and pulp of the teeth. The enamel organs and the papillæ grow towards each other, and later the enamel sac caps the papilla. The crown of the tooth alone becomes covered with enamel. The remainder of the enamel organ is found upon the free surface of the tooth for a variable time. It is called the membrane of Nasmyth. (Figs. 10 and 11.) The dentine arises from an active multiplication of the mesodermic (connective tissue) cells. The connective-tissue cells upon the surface of the papilla constitute the odontoblasts (modified osteoblasts). Calcification (dentine) begins upon the surface of the papilla and progresses towards its centre, but it is not complete. The osteoblasts continue the formation of dentine until the dental papilla is entirely surrounded by it. What remains of the papilla constitutes the pulp. During the metamorphosis of the dental papilla, the mesodermic tissue immediately surrounding it undergoes slight condensation to form the follicle of the developing tooth. As the enamel organ recedes from the surface, the follicle increases to such an extent as to envelop the entire rudimentary tooth. That part of the follicle which covers the future root of the tooth undergoes partial transformation into true bony tissue and gives rise to the cementum or crusta petrosa, while the unossified external fibrous layer constitutes the lining periosteum of the alveolus. The development of the permanent teeth is precisely analogous to that of

the milk teeth. The enamel germs for the permanent teeth, with the exception of the molars, bud from the lingual side of the dental shelf in the seventeenth week, the germ for the first permanent molar appearing about a week earlier at the posterior extremity of the dental shelf after the manner of a milk tooth. The germ of the second molar buds from the neck of the first molar in the third month after birth, while that of the third molar springs from the neck of the second about the third year. At birth, therefore, the gums contain the two sets of teeth except the second and third permanent molars. (This account of the embryology of the teeth is taken almost bodily from Heisler's text-book of embryology.)

All writers upon this subject seem to agree in believing that cystic growths connected with the teeth may be of two varieties, *i.e.*, (1) cysts connected with the roots of the teeth; and (2) those connected with the crown of the tooth or several teeth. Much confusion has existed in the matter of classification, because various writers have assumed that all cysts of the jaws have a common point of origin. Eve (*British Medical Journal*, January 6, 1883) makes the statement, "I think all the tumors belong to the same group, the individual specimens presenting only differences in degree of development."

Broca ("Traité des Tumeurs," Vol. ii, p. 35) declares that "The great majority of cysts of the jaws have their origin in tooth follicles."

Magitot (*Arch. Gén. de Médecine*, 1872-73) describes cysts of small size in connection with the fangs of permanent teeth. He gave these the name of periosteal cysts.

Sir John Tomes ("A System of Dental Surgery") divides dentary cysts into two varieties,—those connected with the crown and those connected with the fangs of the teeth.

In view of the method of development of the teeth, it seems highly probable that two varieties may develop,—one of ectodermic and the other of mesodermic origin. The former should contain epithelial structures, while the latter should not.

J. Bland Sutton ("Tumors Innocent and Malignant," 1893) groups all of the neoplasms connected with the teeth

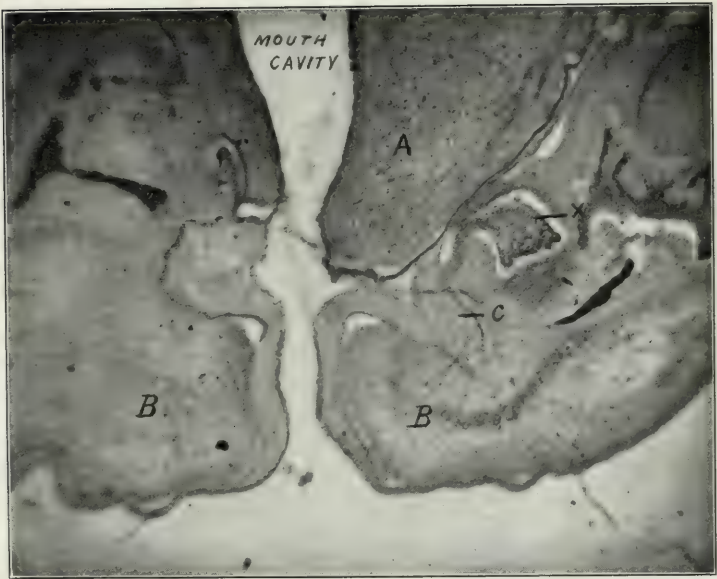


FIG. 6 is a photomicrograph of a sagittal section taken through the region of the canine tooth in a foetus of eight to ten weeks. *A*, tongue; *B*, *B*, upper and lower lips; *C*, dental shelf; *X*, the enamel organ, which is connected with the dental shelf by a long, narrow neck.



FIG. 7 represents a higher magnification of the same enamel organ from the same specimen.



FIG. 8 is a still higher magnification of the region surrounding X, and will show the definite epithelial structure of this neck as well as the direct continuation of the Malpighian layer of the mucosa into it.



FIG. 9 takes us much farther along in the development when the remaining elements of the completed tooth begin to appear. This is again a sagittal section in the region of the canine taken through the decalcified jaw of a fetus eighteen weeks old. The entire structure is now deep in the gum (*a*). The enamel organ has liquefied at *b*, and leaves only the single row of epithelial cells (*c*), which is continuous over the interior of the sac thus made and over the apex of the papilla (*d*), which pushes up from below.

That portion of this epithelial layer alone which caps the papilla becomes the enamel producing section, while the mesoblastic papilla, pushing up under and into this enamel sac, gives rise to the pulp and the dentine of the tooth.

e represents the location of the condensed mesoblastic tissue surrounding the tooth known as the follicle wall, and that portion of this follicle wall below the asterisk subsequently forms the cementum of the tooth.

The apex of the papilla requires further study in Fig. 10.

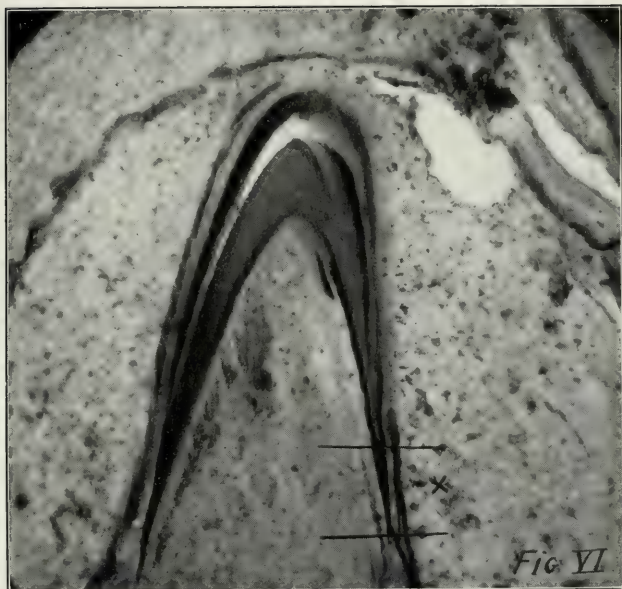


FIG. 10.—Three zones are seen on the left hand side of the apex. The outer zone is the single row of columnar enamel cells. The middle darker zone is the layer of enamel which these cells have produced. The inner and broader zone is the dentine. The centre of the papilla is the pulp. The dentine is produced by the odontoblasts which form the surface layer of pulp-cells, and are best seen by magnifying the area (X).



FIG. 11 shows such magnification. To the left of the three diagonal bands is the pulp. The band to the left is the layer of columnar odontoblasts; the middle band is the dentine that has been produced by these cells; and the right hand band is the row of enamel cells which have not yet produced enamel this far down.

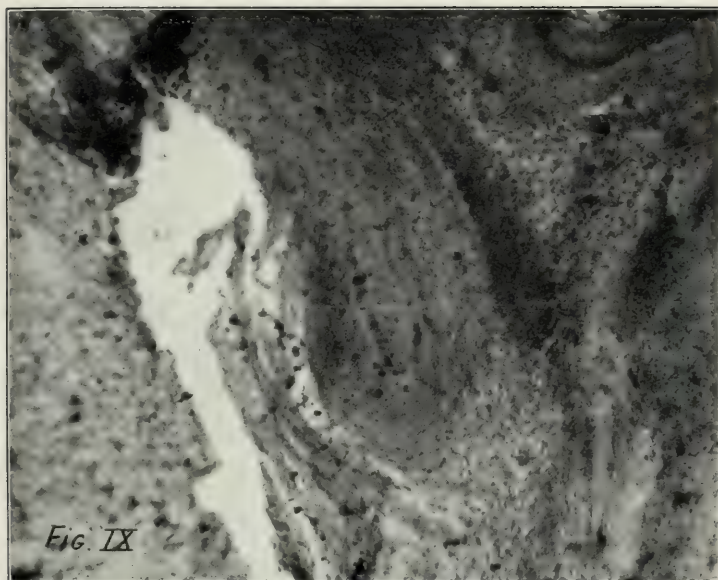


FIG. 12 is merely a magnification of the tip of the enamel organ of the permanent tooth, and will serve to show both its epithelial structure and the condensation of the surrounding tissues to form a tough membrane, which latter may be of pathologic importance.

under the "odontomata," and classifies them according to the anatomical elements entering into the formation of the teeth;—his grouping may be said to be based upon the embryology of the teeth, and hence follows the correct method. According to this author, the following classification is the correct one:

- | | |
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| 1. Epithelial odontome, from the enamel organ. | |
| 2. Follicular odontome. | |
| 3. Fibrous odontome. | } From the tooth follicle. |
| 4. Cementome. | |
| 5. Compound follicular odontome. | |
| 6. Radicular odontome, from the papilla. | |
| 7. Composite odontome, from the whole germ. | |

The vast majority of examples of this affection occur in patients under thirty years of age. Statistics seem to bear out the statement that cystic growths occur at or shortly after the period when the affected tooth should, under ordinary circumstances, be erupted. The third molars on the lower jaw are relatively more frequently affected than any of the other teeth; this is probably due to the fact that they are commonly the last teeth to make their appearance. The canines, usually erupted about the twelfth or thirteenth years, are the next most frequently involved. The incisors, first and second molars, and second premolars are the seat of trouble in about equal proportion. The first premolars are least frequently affected.

These growths occur with about equal frequency in each jaw; possibly the mandible is somewhat more apt to be involved, but not distinctly so. As these growths almost invariably occur in connection with permanent teeth (one connected with a temporary molar is mentioned by Mr. Salter as occurring in the practice of Mr. Alexander Edwards), it may be assumed that there may be a causal relation between their development and irritation in their vicinity at or about the time for their eruption. The mere retention of a permanent tooth within the substance of the jaw after its regular time for eruption, or even its permanent retention, does not seem to be an etiological factor of much importance. It is not at all

unusual to find families in which certain teeth of the permanent set fail to erupt at all; and it is curious to note the uniformity of this deficiency in the various members. For instance, I know a family in which for four generations several of the members in each generation fail to have the upper permanent left lateral incisor and canine teeth appear. An examination, however, proves these teeth to be present in the jaw, but unerupted. None of the members of this family have ever been afflicted with any growth connected with these teeth. They have almost without exception retained the corresponding deciduous teeth until after they were thirty years of age.

Dentigerous cysts have occasionally been found in connection with a supernumerary tooth. (Eugene Talbot, *Chicago Medical Journal and Examiner*, February, 1882. Christopher Heath refers to another similar case reported by Mr. C. J. Fox.)

Sir William Fergusson reported a case of dense osseous tumor of the upper jaw, which, upon section after removal, proved to contain a tooth embedded in its centre. Dr. P. S. Conner has in his possession a beautiful specimen of the same nature.

Cysts and tumors have also been found in connection with imperfect teeth.

Misplaced and inverted teeth have been the apparent starting-point of neoplasms and cysts.

As a general rule, but one tooth is found within these cysts, but, very rarely, two teeth may be included. The second case reported in this paper is an example of this rare condition.

But little is known of the exciting causes of this condition. Mr. Tomes explains the formation of cysts in connection with retained teeth by referring to the fact that "when the development of the enamel of the tooth is completed, its outer surface becomes perfectly detached from the investing soft tissue, and a small quantity of transparent fluid not uncommonly collects in the interval so formed. This fluid ordinarily is discharged when the tooth is cut, but when, *from some cause*,

the eruption of the tooth is prevented, it increases in quantity, gradually distending the surrounding tissues in the form of a cyst."

More remarkable and more unsatisfactory is the explanation given by Mr. Heath that "dentigerous cysts arise in connection with teeth which, *for some reason*, have remained within the jaw and have undergone a *certain amount of irritation*."

Several other explanations are possible, for instance, first, misplacement of the dental germ, either in reference to position and depth in the gum tissue or in reference to the axis of embryonal development and embryonal forces. Second. Embryonal rests. The neck of the primitive bud that springs from the primary enamel germ for the development of the permanent tooth may persist and develop cysts in definite relationship to the crown of a fairly well developed tooth. Such a process is entirely analogous to the rests of the ovary which are left after the infolding of the germinal epithelium, and which are responsible for the cystadenomata of the ovary. (Valentine, "Pflüger Ducts.")

Third. Failure in evolution. (A) The membrane of Nasmyth may become unusually thick and tough and fail to resorb. This may occur with a normally placed follicle, but more particularly when the axis is misplaced and it lies in an oblique, transverse, or reversed position. (B) The wall of the follicle is unusually dense and resistant, giving rise to a similar series of changes to the above. (Fig. 12.) A general or partial jumbling of the enamel and dental papilla at the time of their formation may take place.

Fourth. Irritation. (A) The proliferative activity of the cells concerned in the evolution of the teeth, by reason of displacement, does not meet with the normal juxtaposition and arrangement of cell force and interaction that are believed to be requisite to the normal histologic arrangement of cells in their development. This results in a proliferative activity on the part of the cells of the dental papilla; or, as occurred in the three cases reported and as most often occurs, the sur-

rounding periosteal and their connective-tissue structures undergo proliferation. The histologic structure of the tissue found in the cysts reported is that of giant-celled sarcoma, but they are not sarcomata. They are composed of connective tissue which has reverted to an embryonal or granulation tissue type under the influence of prolonged irritation. (B) The mechanical irritation by an obliquely or transversely placed tooth crowding into the side of an alveolar border may certainly give rise to the same irritative changes that have just been described, and may also explain the three cases reported. The interior wall of the cyst in Case III showed typical granulation tissue. This irritative change is analogous to that found around encysted bullets or other foreign bodies.

M. H. Fletcher, M.D., D.D.S., of Cincinnati, suggests the following ideas in regard to the pathology of this affection.

" At the time of the eruption, when teeth are normal in shape, position, and time, they are never complete in length and shape of the root, nor are they complete until long after the crowns have been entirely exposed and put into use. This incompleteness consists in the root being short and funnel-shaped instead of pointed. The large end is directed into the tissues about them and is sharp like a gun-wad punch. This is true of all human teeth. The molars may be compared to a thimble, with the sharp lower edge pushed into the soft embryonic tissue when pressure is brought to bear upon them. At this age of life bone tissue is comparatively soft and incomplete. This is especially true of the face and jaws. On the other hand, long before a tooth is erupted the enamel is hard and complete, and the enamel organ has disappeared save for its remnant in the form of Nasmyth's membrane as a film over the outside surface of the crown. The enamel at this time is practically as hard as it ever will be, and its edges are thin and sharp. The formation of dentine is upon the inside of this enamel cap, and its incomplete edges are also sharp until the apices of the roots are formed. And this does not normally occur even in the incisors of the milk set until about the fifteenth or eighteenth month after birth, the last of the milk set not being completed until the twentieth to the twenty-fourth month. In the

permanent set the first to mature are the first molars about the ninth year. The last of the permanent teeth are not completed until near the twentieth year. Thus it is seen that at all times between the ages of one and a half and twenty years there are from four to twenty teeth in a good condition to produce irritation of all degrees. Between the ages of six and fourteen there is the greatest number, and it is between these ages that the disease under discussion most frequently appears. To produce irritation, it is only necessary to have sufficient pressure or a stroke hard enough to force one of these uncompleted teeth into the tissues below them, and this may easily occur when a tooth is far enough developed to have penetrated the bone above its crown, and yet not to have perforated the flesh. At this age the only real attachment the tooth has is a narrow ring of the root just below the finished edge of the enamel. This attachment is often not wider than a sixteenth or an eighth of an inch. As the tissues below it are soft, the bone not having formed, excepting a slight ring at the neck to which the thick, elastic peridental membrane is adherent, it is evident that this attachment could easily be ruptured by downward pressure. This lateral attachment will, of course, be greater after the tooth has erupted, but then the facilities for injury are also increased because the crowns protrude and are being used. Pressure upon the teeth and alveolar ridge from mastication is brought to bear many times a day, and it is easy to imagine that inflammation once started may be so continuous that the surrounding embryonic tissues could be excited into the production of new growths of a connective-tissue nature. From continuity of tissue it would seem perfectly easy for the dental follicle of the neighboring tooth to become inflamed from irritation of one that has erupted."

These explanations are good so far as they go, but they fall short of the real explanation of the cause of the failure of the tooth to erupt. Rhachitis has been given as the possible cause of the failure of the teeth to form perfectly and erupt. Analysis of the reported cases would seem to give some strength to this view, because many of the teeth found in these cysts are imperfect so far as the roots are concerned. Since the cementum, which completes the roots, is very similar in its

nature to bone, one can readily see how a failure of bone products in rhachitis might have a very important bearing upon the retention of the teeth. In order to test this idea, sections of the various teeth taken from cysts of this character have been made, but the results failed to show any uniformity in regard to the amount and character of the deposit of cementum. This would seem to negative the idea that the increasing deposit of cementum is what causes the tooth to erupt.

The real question in the pathology of this infection hinges upon the non-eruption of the tooth. It is not difficult to conceive how a retained tooth will produce irritation, but there does seem to be great obscurity in regard to the causes which produce the eruption of the tooth.

Theoretically, cysts of epithelium and of connective-tissue formation should be found, the former arising from the enamel organ and the latter from the tooth follicle. Various observers have corroborated this theoretical prophecy and have classified the cysts accordingly.

Sutton says, "Histologically, an epithelial odontome consists of branching and anastomosing columns of epithelium, portions of which form alveoli, the cells occupying the alveoli varying, the outer layer being columnar while the central cells degenerate and give rise to a tissue resembling the stratum intermedium of an enamel organ. They probably arise from persistent portions of the epithelium of enamel organs."

Mr. Baker (Transactions of Tenth International Congress of Medicine, Band v, Abtheilung 14, p. 103) reports a case with cysts attached to the palatine and posterior buccal roots of a left, upper, first molar tooth.

"The one on the posterior buccal root exhibited the usual structure of these growths, viz., an outer, thicker layer of fibrous tissue with elongated cells evidently derived from the root membrane, a middle layer consisting of rounded, enucleated cells arranged in irregular rows with a felted arrangement of fibres between, and an internal layer of granulation tissue in which

some thin-walled blood-vessels were to be seen, and in the centre of the granulation tissue a cavity which contained a small quantity of pus. None of the sections exhibited epithelium. It was therefore purely of mesoblastic origin. The other cyst was similar in composition to the former one, except that 'on the granulation tissue stood a double row of *columnar, ciliated* epithelium.' "

This observation is entirely at variance with all others, with the exception of one reported by Dr. Rothman. The almost universal opinion is that epithelium is not found in cysts connected with the roots of the teeth.

Mr. Eve (*British Medical Journal*, 1883) holds that the epithelial lining of such cysts may be due to an ingrowth from the epithelium of the gum.

The recognition of the real nature of these growths rests very largely upon the following four points: First, absence of a permanent tooth after it should have been erupted, without any history of its removal. Second, the cystic nature of the growth. Third, the crackling sensation of the thin bony cyst wall when pressed upon. Fourth, exploratory incision.

The development of a cyst at or near the time for the eruption of a permanent tooth may be of value in diagnosis, as may also the slow increase and painless development of the neoplasm. "Crackling" is by no means a constant symptom, and is inferior in diagnostic import to tapping or incision. In any case of cyst connected with either jaw, incision of the mass should precede excision of a part or all of the jaw. This conservative measure does not interfere with the radical one, and may frequently obviate any mutilating procedure.

The prognosis is uniformly good both as to the life of the individual and from an æsthetic point of view.

The evacuation of the cyst, removal of the tooth, thorough curetting of the interior, with subsequent packing of the cyst cavity, is the proper procedure in all cysts connected with the teeth. This mode of attack will certainly remove the growth as well as the cause of it. Cysts in connection with the teeth

never require removal of osseous structures in order to bring about a cure. Of course, one can imagine the implantation of a malignant growth upon one that was originally benign, but the literature on the subject does not record an example of such transformation.

EXCISION OF THE CLAVICLE.

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Surgeon to Long Island College Hospital, St. John's Hospital, and Norwegian Hospital.

EITHER partial or complete excision of the clavicle is done for tumor, necrosis, compound fracture, and for exuberant callus.

At first thought, bearing in mind the anatomical relations of the bone, it would appear that its entire removal would render the arm of that side useless, but as a matter of fact this is not true, as is well shown in my cases.

CASE I.—*Sarcoma of the Clavicle*.—A. H., thirty-seven years of age, was admitted to the Long Island College Hospital on July 20, 1896. He gave the following history: About May, 1894, while wrestling, he injured the left clavicle. Three months later a tumor appeared about the middle third of the bone, and from then on steadily grew, without much pain, until November 18, 1895, when it suddenly ruptured while he was walking on the street. The hæmorrhage was very profuse; an ambulance from the E. D. Hospital was summoned, and he was removed to that hospital. On the following day the tumor was removed. The hæmorrhage during the operation was very severe, and it was with difficulty that it was controlled. He made a slow recovery. Four months later he noticed a return of the growth. This has been steady and painless. On admission to the hospital he says the tumor has the appearance and is about the size it was just before it ruptured on previous occasion. At the site of the middle clavicle was a mass about the size of a hen's egg, the skin over it was purple and very tense. The growth was firmly attached to the clavicle and painless on pressure. The movement of the upper extremity was not restricted by its presence.

On July 21, 1896, after due preparation, the patient was placed under an anæsthetic and an incision made from the tip of the acromion process to the middle of the suprasternal notch; at its middle it encircled the growth. By careful dissection the

growth was freed from the structures of the neck and the entire length of the clavicle exposed. A chain-saw was then passed around the bone internal to the mass and the bone divided. The outer portion of the clavicle, together with the tumor, was then dissected away. The inner fragment was then seized with bone forceps, and with scalpel and scissors carefully disarticulated. This was the most difficult part of the operation on account of the close proximity of the left subclavian vein and also the thoracic duct. No enlarged glands were found. The wound was sutured with interrupted silkworm gut and a small drain of iodoform gauze introduced. The amount of blood lost was not very great; duration of operation forty minutes.

Recovery was rapid. The wound healed by primary union except at the site of drainage. The patient was able to be about on the sixth day, and by the end of the week was able to move the arm to a limited extent. At the end of six weeks movements of the arm were complete, and strength rapidly returned. Within three months he returned to his work as porter in a rubber factory, and has since done the same class of work as previous to the operation. Thirty-three months after the operation there was no evidence of return. The pathological report on the tumor removed was osteosarcoma.

CASE II.—*Sarcoma of Clavicle*.—M. D., Irish, aged twenty years, domestic, was referred to me by Dr. Rankin. For two months she had suffered from severe neuralgia in the right arm and shoulder. This was soon followed by swelling of the arm and shoulder. The pain had become very great and patient was unable to get any relief.

Examination showed the arm swollen and a swelling about the clavicle which extended into the neck from the posterior surface of that bone. Pressure on this tumor increased the pain in the arm. There was no projection anteriorly.

Operation, May 15, 1897. Incision from acromion to middle of sternal notch. The clavicle was exposed for its entire length. Disarticulation of the acromial end was the next step, and then lifting up the bone it was separated from the underlying structures until the inner end was reached, and then scissors were employed to divide the sternoclavicular ligaments, and complete removal of the bone was effected. The extension of the growth into the neck required quite extensive dissection along the vessels and nerves

and the removal of a portion of the apex of the pleura. The opening thus made in the pleura was sutured with catgut. The skin was sutured with interrupted silkworm gut and a small drain of iodoform gauze introduced. The patient made an uneventful recovery, and on June 22, 1897, was discharged from the hospital, having at that time complete use of the arm.

This case never reported further to us, and inquiry at the address given failed to find her.

The report of the pathological findings by Dr. J. M. Van Cott was osteosarcoma.

CASE III.—*Sarcoma of Clavicle, Sternum, and First Rib.*—D. W. P., aged fifty-five years, Irish, longshoreman; also referred by Dr. Rankin. Admitted August 10, 1897. Patient ascribes his trouble to an injury received three months since. He first noticed a small growth about two months ago; this has grown very rapidly, and has been quite painful, especially on abduction of the bone.

Examination reveals a hard, nodular tumor on the upper surface of the clavicle at the sternal end. Skin over it is not changed. Pressure on the tumor increases the pain, which radiates into the neck and back of head.

August 14, 1897. Incision into the tumor showed it to have started in the sternal end of the clavicle and to have the gross appearance of sarcoma. Complete extirpation of the clavicle was determined upon, and was done as described in Case II. After removal of the clavicle, the growth was found to have invaded the sternum and first rib also. A chain-saw was then passed around the first rib just internal to the vessels, and the bone divided. Then with the finger behind the sternum, so as to protect the soft structures, a Hey's saw was used to divide the sternum from the left sternoclavicular articulation to the second chondrosternal articulation. This allowed of the removal of a triangular portion of the sternum and the inner third of the first rib, the sections of bone having been made in apparently healthy tissue. Several enlarged glands were removed from the anterior mediastinum.

The wound was closed except for a small point at the outer angle for drainage. Duration of operation, forty-five minutes.

There was considerable discharge for a number of days and the sinus was slow in closing, the patient not being discharged for

six weeks. At this time he had complete use of the arm. Pathological report was sarcoma.

On December 7, 1897, the patient was again admitted to the hospital suffering with a fracture of the base of the skull, from which he died on the second day. There was no evidence of return of the growth.

The most remarkable thing in these cases is the complete functional result obtained and the short time it takes for it to develop. While the operation ordinarily is not technically difficult, one must always bear in mind the close anatomical relations of the clavicle to the vessels and nerves of the upper extremity, and at the sternal end the innominate artery on the right side, and the thoracic duct on the left. In our experience, it is much less difficult to begin by disarticulation of the bone at the acromial extremity, as the field is free and parts well exposed, while trying to liberate the sternal end.

There have been reported only forty cases of complete excision, with a mortality of seven, or about 18 per cent.

Of incomplete excision for various conditions, there have been about 100, with a mortality of 14 per cent.

We have to report two cases of partial excision with one death. In the fatal case, a portion of the clavicle was excised to facilitate ligation of the subclavian vessels in a case of aneurism. In this case death was the result of acute anæmia.

CASE IV.—*Exuberant Callus at Site of Fracture of Clavicle.*
—Male, aged forty years. Applied for treatment at the Norwegian Hospital because of severe pains in the left upper extremity. He had been unable to sleep for a couple of weeks, and had not been free of pain for several weeks. Two months before he was caught in a hole by the dirt caving in, and a fracture of the left clavicle resulted.

Examination showed marked over-riding of the fragments and a large mass of callus projecting from the posterior surface of the clavicle. There was marked atrophy of the muscles of arm and partially of hand.

After consultation with Dr. Wm. Browning, it was decided



Eight weeks after operation, showing strength of arm after complete removal of the clavicle.

that the pain was due to pressure of the callus on the brachial plexus, and that the best treatment would be to remove the middle third of the bone. An incision was made over the mass and the surrounding structures dissected away. A chain-saw was passed around the bone at either side of the mass and the bone cut through. The mass was then removed and the wound closed without drainage. Wound healed by primary union. The pain was completely relieved. After two weeks the patient was able to use the arm as well as ever, and a marked improvement in the atrophied muscles was evident. It has not been possible to trace this case since discharge.

OSTEOMA OF THE KNEE-JOINT.¹

BY R. TUNSTALL TAYLOR, M.D.,

OF BALTIMORE,

Surgeon in Charge of the Hospital for Crippled Children; Clinical Professor of
Orthopædic Surgery, University of Maryland.

I WISH at this time to report the following case as being of especial interest and unusual, from the very large size of the osteoma found, to emphasize the great importance of the skiagraph in making diagnosis possible in such cases, and in pointing out the proper mode of treatment.

Such a case could have been painted with iodine, worn elastic stockings and various braces, had massage and electricity indefinitely without cure. Nothing short of the radical removal of such a partially loose body in the knee-joint could afford relief.

I do not consider that there is any more danger in opening the knee-joint even for exploration than in opening any serous or synovial cavity elsewhere, but the most scrupulous technique in asepsis is necessary to insure success, of course.

CASE.—J. H., aged nineteen years, presented herself for treatment. Her family history was negative, and her past history had no bearing on the present trouble.

Her present trouble began four years ago, when in stepping from the street to the pavement her foot caught on the curb and her right knee gave way, bending backward violently. Rising, she went to school, whither she was bound, and thought no more about it, until after sitting for some time she started to rise, when she found she was unable to straighten her knee and could bear no weight on that leg. She was carried home, and could not use her leg for four weeks, when it gradually improved until she was able to bear her weight upon it again, but motion in the knee-joint

¹ Read before the American Orthopædic Association, June 5, 1902.



FIG. 1.—Osteoma in knee-joint attached to crucial ligament; bone probably developed from internal intercondyloid tubercle, which was torn loose from tibia at time of accident.

remained permanently limited to 150 degrees in extension. The joint was at first slightly swollen and quite painful, aching and throbbing. Atrophy at, above, and below the knee was present when she came to me. A point of maximum tenderness was just under the patellar ligament. There was at no time any constitutional disturbance. The patient had been treated for two years for rheumatism and had local massage. She did not improve under this treatment. In October, 1901, she consulted me. Operation was then advised, but static electricity and massage were tried for three months. The knee was made more comfortable under this treatment, but motion in joint did not become any more free, and tenosynovitis was constantly present over the quadriceps and patella tendons.

Three X-ray pictures of the joint were taken and showed a foreign body in joint, which projected from and into the intercondylar notch, and which the X-ray stereoscope showed was apparently attached to and nearer the external side of the internal condyle. (Fig. 1.)

January 15, 1902. Under ether, an incision, about four inches (twelve centimetres) in length, was made on inner side of the knee-joint. When the capsule was opened, a foreign body was seen occupying a position between the condyles, as shown in the skiagraphs. This body at first appeared to be the size of a small marble on looking in the joint, and was movable. On further examination the body was found to project into the intercondylar notch; it was attached above to the under surface of the patella by the plica patellaris synovialis, and on its medial side to the internal condyle. After several attempts, it was found to be impossible to remove the body through the inner incision without considerable trauma to the joint, so that a counter-incision was made on the outer side and the joint exposed as on the inner side. The foreign body was then grasped by long forceps on the inner side, being pushed from the outer, and its attachments loosened with a curved scissors; it was situated outside of the synovial membrane, but surrounded by a reduplication of this membrane and attached to the under surface of the patella by the plica patellæ synovialis. The body, or osteoma, when removed was much larger than it appeared to be on looking in the joint, as the largest part of it was within the intercondylar notch, and hence its difficulty in removal. Its size is (one by one and a half

inches) three by five centimetres in length and breadth and (two inches) seven centimetres in circumference. It was pyriform; its free surface was trochlear in shape and smooth like the articulating surface of a bone (Fig. 2). There was a small sesamoid bone attached by a ligamentous band to the posterior extremity of this large osteoma. This ligamentous band was evidently the anterior crucial ligament which had been torn loose from its tibial attachment, and in it the osteoma developed. The capsule and skin incisions were closed by silver-wire sutures (continuous and subcutaneous respectively), and the wound dressed with silver foil and gauze. From toe to groin the leg was encased in plaster of Paris in full extension, which was now possible for the first time.

January 16. Patient's temperature rose to 101.5° F. as the maximum evening temperature.

January 17. Maximum temperature (9 P.M.) was 100° F.

January 20. Dressings changed. Wound healed per primam. Sutures not removed. Temperature has not been above normal since January 17.

January 27. Sutures removed. Motion free and full extension possible.

February 5. Massage given daily.

February 9. Patient discharged well, with perfect use and function.

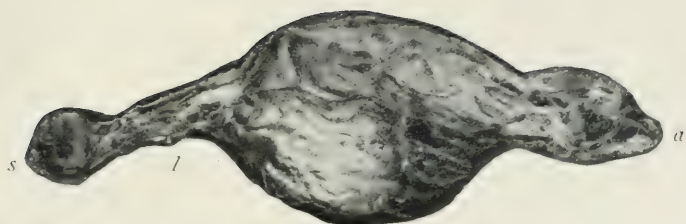


FIG. 2.—Osteoma from the knee-joint. *a*, Anterior extremity; *l*, remains of crucial ligament; *s*, sesamoid bone.

POSTERIOR DISLOCATION OF THE HEAD OF THE TIBIA.

WITH THE REPORT OF THREE CASES.

BY JOHN G. SHELDON, M.D.,
OF TELLURIDE, COLORADO.

CASE I.—A teamster, thirty-four years of age, in attempting to stop a team of horses, was so brought in contact with a rapidly moving truck that the hub of one of the front wheels struck him on the anterior surface of the leg just below the knee. He was felled to the ground, but retained consciousness. After sustaining the injury, he found that his right knee was fixed in the extended position, and that it was painful.

Examination, two hours after the accident occurred, showed a complete posterior dislocation of the head of the right tibia. The femur and tibia overlapped each other about two inches. No skin wound was present. The swelling was moderate; evidences of extravasation of blood were slight, and the circulation in the leg did not seem affected. Under general anæsthesia, the dislocation was easily reduced by extension and by direct manipulation of the tibia and femur. Forty-eight hours after the injury occurred, the patient was very comfortable. Very little swelling and discoloration were present, and the foot and leg were warm. Twelve hours later—sixty hours after the knee was injured—the extremity was cold and livid to the knee. Evidences of gangrene followed shortly, and the next day the thigh was amputated in its lower third.

CASE II.—A miner, forty-one years of age, while rapidly descending a steep incline, stepped into a crevice between the rocks. His leg was held firmly, and his body was thrown forward violently. Examination showed a complete posterior dislocation of the head of the tibia, compounded on the inner side posteriorly. The swelling was moderate, and the circulation did not seem impaired. Reduction was done under general anæsthesia. Everything went well till the fourth day, when the extremity became pale and cold to a point above the knee. Evidences of gangrene were soon manifest, and a thigh amputation was done.

CASE III.—Through the kindness of Dr. John B. Murphy, of Chicago, I am permitted to report this case, which came under Dr. Murphy's observation in 1881.

A curb-flag, which had been left standing on end by the stone-cutter, fell against the patient's knee. The injury therefrom was a complete posterior dislocation of the tibia, complicated by a small flesh wound posteriorly. The dislocation was reduced. On the third day following the accident, gangrene was manifest. The gangrene extended to the knee. The patient died two or three days later, five or six days after the accident occurred.

On looking up the literature of posterior dislocation of the head of the tibia, I find that the case reports do not correspond with some of the statements made in the ordinary text-books of surgery. In the "International Text-Book of Surgery," Vol. i, p. 638, the idea is conveyed that posterior dislocations of the head of the tibia are usually incomplete. Of the fifty-two cases that I can find records, thirty-seven were complete and only fifteen incomplete. The three cases herewith reported were also complete dislocations. Another statement that I have read—though not bearing directly on the subject—ought to be mentioned. In Park's "Surgery," condensed edition, p. 616, it is stated that injury to the popliteal vessels is more apt to occur in anterior dislocations than in the posterior variety. According to the records of reported cases, injury to the popliteal vessels and gangrene occur more frequently in the posterior displacements. One writer states that the popliteal notch on the posterior surface of the femur protects the popliteal vessels in anterior dislocations of the tibial head, while no such notch or depression is present on the dorsal surface of the tibial head to offer protection in posterior dislocations of the knee.

Posterior dislocation of the head of the tibia is a rare condition. I have been able to find reports of only fifty-two cases. Some of them were published as early as 1787. In 1894, Cramer, in his inaugural dissertation at Wurzburg, discussed the condition, but his list of cases is far from complete.

Only two cases have occurred in the patients treated in Cook County Hospital, Chicago.

Posterior dislocations of the head of the tibia may be produced by direct or indirect violence. The injury in the fifty-two cases that I have records of, and in the three herewith reported, was produced in the following ways:

In four cases the dislocation was produced by the leg being held in a fixed position while the remainder of the body was thrown violently forward. In all of these cases the dislocation was complete. One case was compounded and gangrene followed.

In sixteen cases the accident consisted of a fall. Ten of these were complete and six were incomplete. Two were followed by gangrene. None was compounded.

Six cases resulted from entanglement in machinery. In three the dislocations were complete. A compound dislocation was present in one case. Gangrene occurred in two of them.

In three cases no cause for the dislocation was given. Only one of these was complete. Compounding or gangrene was not present in any of them.

In four cases the dislocation resulted from the patients being felled to the ground by falling or moving bodies. Three of these were complete; one was compounded, and gangrene occurred in one.

Direct force, applied to the lower and posterior aspect of the thigh, was responsible for the dislocation in seven cases. Six of these were complete, two were compounded, and gangrene occurred in one.

The most serious injuries resulted from the direct application of force to the anterior surface of the leg or to the knee. In fifteen cases the dislocation occurred in this manner. Ten of these were complete; three were compounded, and gangrene occurred in three of them.

Previous diseases or injuries were not mentioned in any case as predisposing to the dislocation. The patients were

all in perfect health at the time of the injury. Two cases only occurred in women.

In forty cases of the fifty-five reported, the dislocation was complete. Seven of the forty complete cases were compounded, and in nine of these gangrene occurred. Of the fifteen incomplete cases, only one was compounded, and in only one did gangrene occur.

Total number of cases, 55.

Complete dislocations, 40.

Complete compound dislocations, 7.

Complete dislocations, with gangrene, 9.

Incomplete dislocations, 15.

Incomplete simple dislocations, 14.

Incomplete compound dislocations, 1.

Incomplete dislocations, with gangrene, 1.

Total number of compound dislocations, 8.

Total number of dislocations with gangrene, 10.

The only feature in the symptomatology diagnosis or prognosis of posterior dislocations of the knee that I shall discuss is gangrene. This condition occurred in ten cases. In nine of these the dislocations were complete, and in only one was it incomplete. The occurrence of gangrene does not seem to bear any direct relation to the external evidences of injury to the tissues. In seven of the gangrenous cases the dislocations were not compounded; while in five compounded dislocations no gangrene complicated. A reliable prognosis cannot be given on making an examination shortly after the occurrence of the accident. Another misleading feature in these cases—from a prognostic stand-point—is the fact that the first evidence of gangrene, or of impaired circulation in the injured member, may not be manifest for some hours or days after the injury. The impairment of the circulation may be indicated, at the time of the injury, by a very feeble posterior tibial pulse. (Vast's and Wagner's cases.) Usually there is no indication of impaired circulation till the third day, then the leg becomes cold and gangrene rapidly supervenes. These changes may come on as early as the

second day or as late as the fourteenth. It is stated in the "International Text-Book of Surgery," Vol. i, p. 639, that gangrene may occur three or four weeks after the injury. I can find no record of cases of this character.

In most cases the gangrene extended to the knee. In one case it extended slightly above the knee; and in Reisinger's case the line of demarcation was found at the middle of the leg seven weeks after the dislocation had occurred.

AN APPARATUS TO FACILITATE THE APPLICATION OF PLASTER JACKETS DURING SPINAL HYPEREXTENSION.

BY ERASMUS DARWIN FENNER, M.D.,

OF NEW ORLEANS,

First Assistant Surgeon to the Charity Hospital; Lecturer on Diseases of Children in Tulane University.

THE introduction of the plaster jacket in the treatment of spinal disease by Sayre marked an epoch in orthopædic therapeutics. Nothing more efficient or more universally applicable has since been discovered. But from the beginning there have been obvious objections to his method of suspension in putting on the jacket. In patients of all ages the strain on the neck is painful and fatiguing, and in young children, who are the very ones for whom a jacket is most often needed, the pain and fright are accompanied by struggling and screaming, which are not only embarrassing to the surgeon, but frequently oblige him to take the child down before the plaster is thoroughly hardened. To escape these annoyances, efforts were made to devise a satisfactory method of applying the plaster in the recumbent position. Hammocks of cloth, tightly stretched upon an iron or wooden frame, upon which the child was laid, were used by some, but were never widely adopted because it was impossible to prevent a certain amount of sagging as soon as the child's weight was imposed upon the cloth.

The teaching of Calot in 1897, who recommended the immediate, forcible rectification of the deformity of Pott's disease, gave a new impulse to the treatment of this disorder. Up to that time the "practical ideal" of the orthopædic surgeon had been to prevent an increase of existing deformity,—an ideal which, by the way, was seldom realized. The idea of *correction* was now introduced, and surgeons all over the world began to submit patients to Calot's method. Accumu-

lated experience has resulted in the abandonment of this radical procedure, and in its place have been adopted methods aiming at the gentle, gradual correction of the deformity by hyperextension, and the application of the corset in this position. The most widely used appliance for this purpose has been the Goldthwaite frame and its modifications, figured in Whitman's "Orthopædic Surgery," and in routine use at the New York Hospital for the Ruptured and Crippled. This is an excellent method. It tends to a gradual and painless correction of the deformity; it permits the application of the jacket in the recumbent posture, and the patient lies comfortably on the frame until the plaster is thoroughly dry. I have used it frequently and with satisfaction. Until the apparatus devised by Dr. J. D. Bloom, of the New Orleans Charity Hospital, was constructed, I considered the Goldthwaite frame the best method of applying plaster corsets. The superior merits of Dr. Bloom's apparatus are, however, so apparent, that it has but to be seen to be appreciated, and to be used once to be adopted for good and all. It combines cheapness, durability, simplicity, and efficiency. And it can be used for adult patients with as much satisfaction as for children.

The accompanying illustrations exhibit so clearly the construction of the apparatus that little can be added by way of description. The important feature of the apparatus is the *jack-screw*, which is placed directly beneath the knuckle of the deformity. This has for a base a broad, heavy disk of iron, from which rises a column of ordinary gas-pipe with an internal thread, in which plays a smaller pipe with external thread. A ring with suitable knobs is introduced to facilitate the extension and recession of the screw. A metal disk, *loosely* attached to the top of the screw, so as to permit its independent movement, is surmounted by a solid rubber ring pessary, which prevents painful pressure upon the spinous processes. The iron frames at either end support the shoulders and the pelvis, and are made more comfortable by laying a square of heavy pasteboard across them, and a little padding such as a folded sheet or cotton batting. These frames and

the jack-screw are connected by two iron bars, which play in slots in the base of the jack-screw and frames, and may be fixed by suitable thumb-screws, and which are pulled out when the patient is to be removed from the apparatus.

Upon this appliance the patient lies securely and comfortably. The screw is placed directly under the deformity, the spinous processes having been previously protected by felt-ing, and the screw is gradually lifted, gently overcoming the muscular contraction and extending the spinal column at the site of the deformity. When the maximum of extension has been obtained, the jacket is applied, leaving an opening behind where the body rests against the ring, and where pressure by the corset often requires that a fenestrum be made. After the corset is dry, this weak spot can be reinforced by the application of a supplementary plaster bandage. After a rather extended experience in plaster work, I confidently assert that nothing so practical or efficient as this apparatus has up to this time been called to my attention.



FIG. 3.—Dr. J. D. Bloom's apparatus in use. In this picture the frames to support the shoulders and pelvis are an earlier model, not so good as the ones shown in the other illustrations.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, October 22, 1902.

The Vice-President, HOWARD LILIENTHAL, M.D., in the Chair.

FLAIL-JOINT AFTER EXCISION OF ELBOW-JOINT.

DR. ROBERT H. M. DAWBARN presented an old case of excision of the elbow-joint, seen by him during his recent service at the City Hospital. The patient presents the worst possible result,—a “flail-joint.” The insertion of the triceps was evidently sacrificed; and in consequence the patient is unable to extend the forearm with any degree of force whatever. Regarding the rarity of “flail-joint” after excision, Dr. Dawbarn said that this was the first he had seen, in twenty-one years’ experience, that deserved to be called by so extreme a name. He recalled the fact that the late Dr. Henry B. Sands had remarked that he had never had but one case of “flail-joint” from elbow-excision, though several with partial lack of complete freedom of motion.

In the present case, by a very considerable shortening of the length of the limb, a more nearly normal joint might be secured, together with a reinsertion for the triceps muscle. However, he was inclined to advise the use of a rectangular wooden or felt splint, fitted to his arm and forearm, and fastened by straps and buckles above and below; and that he should thus, by making a fixed point of the elbow, at an angle permitting him to feed himself, be enabled to gain a much better use of the muscle of the forearm than is now possible.

DR. GEORGE D. STEWART said the patient exhibited by Dr. Dawbarn was operated on at Bellevue Hospital during his service there. The man was sent to Bellevue from the almshouse, suffering from an untreated fracture of the right humerus, about four inches above the elbow-joint. At least two inches of the upper

fragment protruded through the skin and had necrosed. This was cut away, and the arm was put up in a proper splint. While the wound was granulating, the man, while out on a pass, became intoxicated and disappeared. Some months later he became engaged in a brawl, and was brought back to the hospital as a prisoner. Upon examination, a refracture of the humerus was made out, and subsequently the entire lower fragment of the bone was found to be necrotic. This section of dead bone was pried out with a periosteal elevator. The upper extremities of the corresponding radius and ulna were also necrotic, and the articulation was entirely destroyed.

As a matter of fact, therefore, Dr. Stewart said, no resection of the elbow-joint was even attempted in this case, but simply the removal of necrosed bone. He still presents evidences of a necrotic process going on in the ends of the involved bones, so that, instead of having had too much bone removed, there was really not enough removed.

THYROGLOSSAL DERMOID.

DR. GEORGE E. BREWER presented a negress, aged thirty-five years, who first noticed a lump under the middle of the lower jaw on May 5 last. It grew rapidly but without pain until the middle of June, when she presented herself for treatment at the Roosevelt Hospital. On admission, she presented a large oval painless tumor between the symphysis of the jaw and the hyoid bone. The mouth was widely open, the tongue was lifted to the roof of the mouth, and there was constant salivation. For the previous few days swallowing was impossible except for fluids, and there was some embarrassment of the respiration.

Under chloroform anæsthesia, a median incision was made over the most prominent portion of the tumor, and the muscles separated until the white glistening capsule was reached, which was found to be between the geniohyoid muscles. The tumor was easily separated from its attachment, but could not be delivered through the opening thus made. The mouth was then widely opened and the floor of the mouth exposed by cheek retractors. A semilunar incision was made through the mucous membrane, along the alveolar border, and the floor of the mouth retracted backward. The tumor was then separated from its attachments by the finger introduced from above and below, but it seemed

impossible to deliver it through the mouth. It was thought that it would be necessary to saw through the jaw, but before resorting to this procedure, another attempt was made to push it outward through the mouth. This was finally rendered possible by forcing the jaws widely apart with the heavy screw mouth-gag.

The mucous membrane was sutured with catgut and the external wound united with silkworm gut. Recovery was uneventful. The tumor was oval, and measured seven inches in circumference.

DR. JOHN F. ERDMANN reported a case of thyroglossal dermoid in which the growth was considerably larger than the one shown by Dr. Brewer, and which he succeeded in removing, with much difficulty, through the floor of the mouth. The operation was rendered more difficult by the fact that the man could not be kept under an anæsthetic, and on account of adhesions resulting from an operation which had been done through the submental region a year previous. The patient made a perfect recovery.

RUPTURE OF THE KIDNEY.

DR. GEORGE E. BREWER presented a negro boy, four years of age, who was admitted to Roosevelt Hospital in August last, a short time after receiving a contusion of the left flank and abdomen, caused by falling down a flight of stairs. There was comparatively little evidence of shock; so little, in fact, that the child fell asleep soon after the injury, and the parents did not consider the question of seeking medical advice until it was noticed that the boy passed bloody urine.

On examination, there was found only a slight tenderness over the left lumbar region. There was no evidence of free fluid in the peritoneal cavity, and no rigidity of the abdominal muscles. The child had not vomited, and made no complaint unless handled.

A diagnosis of severe contusion or rupture of the kidney was made, and the child immediately prepared for operation. Under chloroform anæsthesia, an oblique lumbar incision was made, exposing the kidney, which was found surrounded by a large mass of clotted and fluid blood, having a decidedly urinous odor.

When the kidney was exposed, a transverse fissure was found at the junction of the upper with the middle third of the organ.

The fissure extended from the external border to the hilum, freely opening into the pelvis. In fact, the upper segment was only attached to the lower portion of the kidney by a narrow pedicle. The parts were thoroughly disinfected with peroxide of hydrogen and salt solution, and the upper segment replaced against the lower and sutured with catgut. The external wound was united, with drainage, and the dressings applied.

The child reacted well from the operation. The hæmaturia ceased at the end of twenty-four hours, and recovery was uneventful.

EXTRAPERITONEAL RUPTURE OF THE BLADDER COMPLICATING FRACTURE OF THE PELVIS.

DR. BREWER presented a man, aged twenty-five years, who was brought to the hospital in a state of severe shock after a crushing injury to the region of the pelvis inflicted by being rolled between a car and a brick wall. He complained of great pain about the pelvis, which was accentuated by any movement of the trunk or legs; he also had a strong desire to urinate. On examination, there was observed mobility and crepitus, easily appreciated whenever the iliac crests or other portions of the pelvis were moved. Tenderness was well marked in the hypogastric region, and a semisolid tumor was appreciated just above the pubic symphysis.

On catheterization, the bladder was found to contain only a small amount of bloody fluid; previous spontaneous efforts at urination had been ineffectual.

The pulse was rapid and weak, the temperature subnormal, the patient was apathetic, and could give no intelligent account of the accident. He was immediately prepared for operation. Under ether anæsthesia an incision was made in the median line, just below the umbilicus, and the peritoneal cavity opened for purposes of exploration. Through this incision it was easily demonstrated that there was no intraperitoneal rupture, but that there was an enormous hæmatoma of the prevesical space, extending more to the right than the left side. The abdominal wound was immediately closed, and the prevesical space opened by an extension downward of the original incision. A large amount of clotted blood was found and removed, after which the hæmorrhage from the deeper portions of the wound was very free,

necessitating immediate packing and the administration of a large intravenous saline infusion and other stimulating measures.

As soon as the hæmorrhage was controlled, further examination revealed a transverse fracture of the horizontal ramus of the pubis on the right side, one fragment of which was directed inward, and lay within the cavity of the bladder, passing through a ragged tear in its anterior wall, which extended well downward to the prostatic portion. The displaced fragment of bone was forced back into position and sutured to its fellow by heavy chromicized catgut; the tear in the anterior wall of the bladder was sutured with two or three layers of catgut, and a small opening for drainage was made at the summit of the bladder. These procedures were extremely difficult to carry out, especially the suturing of the deeper portion of the bladder wound, and consumed considerable time. It was the original intention to establish perineal drainage, as there was evidence of injury to the deep urethra and triangular ligament; but before this could be done, the condition of the patient became so critical that the operation had to be abandoned, the wound was hastily packed, and the patient placed in bed. Several infusions were given and every known method of stimulation resorted to in order to save his life. He remained in a condition of severe shock for many hours and then slowly improved. The wound became badly infected in spite of constant irrigation and frequent dressings. Several days later he was again etherized and a perineal opening made into the urethra, through which the bladder was drained; another drainage tube was passed from the perineal wound upward through the triangular ligament above the prostate, to drain the fœl prevesical space. These tubes were left in place for several weeks, until the wound was clean, and until the suprapubic bladder wound, which had sloughed extensively, was beginning to close. They were then removed, and the perineal opening was allowed to heal. Sounds were passed to preserve the patency of the urethra.

The suprapubic opening, however, persisted, owing to its large extent, and as a result a condition of contraction of the bladder gradually developed. The urethra recontracted and the passage of sounds became more and more difficult. A second external urethrotomy was performed, and the bladder drained

for several weeks, in the hope that the fistula would close. This was finally abandoned and the perineal wound allowed to heal.

Efforts were then made to dilate the bladder by injecting each day as much boric acid solution through a catheter as the organ would hold, egress of the fluid through the suprapubic wound being prevented by digital compression. By this means the bladder capacity was increased in thirty days from one and a half ounces to five and a half ounces. He was then discharged and told to report once a week for sounding, in the hope that the suprapubic fistula would heal spontaneously.

During his absence from the hospital, the bladder became badly infected, and he developed a pyelitis on the right side. Sudden plugging of the upper extremity by a calculus caused an acute attack of pyonephritis, which brought him back to the hospital. On admission, his temperature was 104° F.; pulse, 130. He was suffering from a severe, aching pain in the right flank, which was the seat of a large oval tumor.

Nephrotomy was immediately performed, and about twenty ounces of pus and an obstructing ureteral calculus removed.

Two months later a plastic operation was performed on the suprapubic opening, which narrowed it to the size of a darning-needle. Later it closed, and, with the exception of a contracted bladder, the patient is now in excellent health.

SARCOMA OF THE FEMUR.

DR. WILLIAM B. COLEY presented a man, aged nineteen years, who first noticed a swelling in the lower portion of the left femur in November, 1901. This gradually increased in size, accompanied by loss of weight and deterioration of general health. The patient came under his observation February 5, 1902. At this time physical examination showed a large tumor extending from the condyles of the left femur to the junction of the middle and upper thirds. The tumor consisted of a fusiform enlargement of the entire lower two-thirds of the femur; on the outer aspect of the thigh, about one and a half inches above the joint, there was a soft, fluctuating area, just covered by thin and reddened skin. There was a slight impairment of the functions of the joint, but no swelling of the joint itself. An incision was made under cocaine into the fluctuating area and three ounces of clear serum, similar to that which is found in cystic degeneration of sarcomatous

tissue, were evacuated. The curette was passed into the cavity of the bone and typical sarcomatous tissue removed. Microscopic examination, by Dr. E. K. Dunham, showed it to be round-celled sarcoma. The patient absolutely refused operation, although he was told this was the only thing that offered any hope of saving his life. The X-ray treatment was tried entirely as an experiment, with the result that the tumor decreased one inch in circumference. After a month's treatment the exposures were discontinued for two weeks, at the end of which time the tumor had increased nearly an inch in size. The treatment was again resumed and the growth slowly decreased in size, until at the end of another month the circumference of the thigh over the centre of the tumor was one inch less than the original measurement.

The treatment has been continued from February up to the present time, *i.e.*, nearly nine months, although it had to be discontinued for a month on account of a very severe general eczema, starting in the region exposed to the rays and spreading over the entire body. At the present time, the circumference of the thigh over the most protuberant part of the tumor is only half as great again as that over a corresponding portion of the normal side. The bronchial trouble which existed in June, and which led Dr. Coley to suspect metastases, has cleared up, and the patient has gained twenty pounds in weight.

During the month in which no treatment was given, the leg showed a decided increase in size. With regard to the question as to whether or not the improvement will continue until entire absorption has taken place, Dr. Coley stated that this is, of course, impossible to determine as yet. The fact that one of the most malignant types of growth, a periosteal round-celled sarcoma of the femur, has not only been held in check for nine months, but has nearly disappeared, is in itself a very important fact.

RECURRENT MALIGNANT GROWTH IN THE AXILLA.

DR. W. B. COLEY presented a lad, sixteen years of age, with a negative family history, who had enjoyed good health up to the fall of 1901. At that time he noticed in the left axilla a small, hard, painless nodule, about the size of a hazel-nut, slightly movable. It steadily increased in size until his admission to the

Methodist Episcopal Hospital, in the service of Dr. Lewis S. Pilcher, in April, 1902. At that time physical examination showed a swelling in the left axilla and pectoral region somewhat larger than a goose egg, slightly tender and movable on the deeper parts. The skin was movable over it, and there was marked involvement of the axillary contents.

Operation, April 9, 1902. The history states that a curved incision was made over the tumor mass, along the anterior border of the axilla. The axilla was found filled with hard and enlarged glands, varying in size from that of a bean to a pigeon's egg, some of these glands being closely adherent to the great vessels of the axilla. The pectoralis major was divided, and all palpable glands dissected out. The muscle was reunited with chromic gut sutures.

Shortly after leaving the hospital, the growth recurred locally, and the patient was referred to Dr. Coley for treatment, as an inoperable case, on June 20, 1902. Physical examination at that time showed a hard mass, about three by four inches in size, apparently beneath and involving the pectoral muscle and extending to the border of the axilla, rather firmly fixed to the surrounding structures, with all the clinical characteristics of recurrent sarcoma. The patient was admitted to Dr. Coley's service at the General Memorial Hospital, and since July 1 has undergone X-ray treatment, the frequency of the exposures varying from three to four times a week. They were of ten minutes' duration and given at a distance of ten inches. The growth soon showed improvement, which continued steadily until the last of August, at which time the tumor had entirely disappeared. He then developed a slight attack of pneumonia, on account of which the treatment was discontinued for about three weeks. Since the middle of September he has had out-patient treatment, receiving three to four X-ray exposures a week up to the present time. The treatment is continued with a view to preventing a further recurrence, if possible.

MISPLACED TESTIS.

DR. JOHN ROGERS presented a young man who gave the history of a tumor in the right inguinal region, existing from birth, with all the signs of a simple reducible hernia, excepting that it extended upward beneath the skin on the surface of the external oblique muscle, parallel to Poupart's ligament. At the apex of the

mass was the testicle. The right side of the scrotum was empty; the left testicle was in its normal position. At the operation, five weeks ago, the hernia was found to occupy the curious position described above, and to be of the typical congenital inguinal variety with the testicle at the apex of the sac, opposite the right anterior superior spine of the ilium, on the outer surface of the external oblique. An ordinary Bassini operation was performed, and the testicle, which appeared to be normal, was placed in a pocket made in the scrotum. Healing was uneventful. The interest in this case lies in the rarity of the testicular misplacement.

SARCOMA OF THE VERTEBRA.

DR. ROGERS presented a man, twenty-two years old, who began to have pain in the small of his back in 1899. He was treated by various physicians for tuberculosis of the spine, and finally had a plaster jacket applied by Dr. Gibney in 1901. This was worn for a year or more. In February, 1902, a tumor was discovered occupying and involving the spinal lumbar region. A section from the mass was taken and examined, and reported upon by Dr. H. Brooks as a typical giant-celled sarcoma. Signs of paralysis appeared early in 1902, and rapidly increased. Injections of pure erysipelas toxins were begun in February, and continued until May, when they were discontinued, as the reaction was violent and the patient in a very reduced condition. There was complete motor and sensory paralysis below the waist, incontinence of urine and fæces, and a bad cystitis. Altogether, the patient was in a very pitiable and apparently hopeless condition. A month or two later improvement began to occur, and steadily progressed until now (October, 1902) nearly all the distressing symptoms have disappeared. There is still the large tumor in the back, which has only slightly decreased in size, and some little cystitis, with a night frequency of five or six urinations. But the patient, instead of being a bed-ridden paralytic, is able to sit up and walk about.

SARCOMA OF THE HIP-JOINT.

DR. ROGERS presented a woman, twenty-six years of age, who complained of pain in the left hip for several weeks in April, 1898. The pain grew slowly more acute until one day she fell and sustained a fracture of the neck of the femur. She was taken

to Mt. Sinai Hospital and treated in a Buck extension apparatus until discharged cured in July, 1898. She went home, and got about with tolerable comfort, but a couple of months later broke the same hip again in the same place by such trifling violence that the fracture might properly be called spontaneous. She was taken again to Mt. Sinai Hospital, and the evidences of tumor were then so marked that Dr. Gerster considered her case inoperable, and merely removed a section of the growth from the region of the great trochanter. The hospital pathologist reported large spindle-celled sarcoma. The wound apparently failed to unite. She was given the erysipelas toxins at this hospital for three months, apparently without improvement, and was finally sent as a hopeless case to the Montefiore Home in August, 1899. After this she received no more injections of toxins. Dr. Rogers found her in the following year with a large, hard tumor occupying the region of the hip-joint and upper part of the femur, and with a suppurating sinus leading into the largely hypertrophied great trochanter from the outer aspect of the thigh. The bone was united throughout. The leg had a limited range of motion, but the patient was unable to walk on account of the pain it induced. During the next two years repeated attempts were made to close the sinus, and success was finally obtained by Dr. Elsberg, last summer, by injections of a paraffin-iodoform mixture. At each operation the sections examined showed only granulation tissue. During the years she was at the Montefiore Home, and after the injections of the toxins were discontinued, the tumefaction gradually disappeared, until now the condition is like an ordinary case of the fracture of the neck of the femur which has healed with considerable shortening. She can walk with comfort, and is in all respects well. To add to the perplexity and interest in this, is the fact that a year and a half or two years ago she had a sore throat of long duration, and for the past year has been complaining of her nose, and about a month ago she was discovered to have a typical syphilitic perforating ulcer of the nasal septum. She has never until the last week had any antisyphilitic treatment.

DR. WILLIAM B. COLEY said that because this patient, at some considerable period subsequent, had developed a syphilitic ulcer of the nasal septum, it was not necessary to draw the inference that the growth involving the upper portion of the femur, which had been pronounced a sarcoma by a competent pathologist,

was also syphilitic. Both syphilis and sarcoma may exist in the same patient coincidentally or at different times. In a case which came under the speaker's observation in 1893, the patient had an inoperable spindle-celled sarcoma of the abdominal wall, which was successfully treated by means of the erysipelas toxins. Seven years later, this patient developed a typical primary syphilitic lesion on the penis, followed by the usual secondary symptoms of syphilis. In this case the two diseases had no bearing on each other, and the same was probably also true in Dr. Rogers's case.

DR. ROGERS said that an interesting feature in connection with this case was that no improvement in the condition of the hip was noticed until at least six months after the toxin treatment had been discontinued. She had never received any specific medication. The speaker said it was not difficult to conceive that the tumor in the hip could have disappeared spontaneously if it was of syphilitic origin, and suppurated as this did. On the other hand, reports of some cases of sarcoma treated by toxins of erysipelas seem to show that improvement may not take place for at least weeks, but may then begin and continue whether the toxins are continued or not.

DR. COLEY referred to one case in which the fact mentioned by Dr. Rogers was demonstrated very clearly. The case was one of very large recurrent, inoperable, spindle-celled sarcoma involving the thigh and buttocks. The patient was treated about two months with the mixed toxins at the Post-Graduate Hospital in 1894. There was some decrease in size, but progress was so slow the patient became discouraged and left the hospital. Subsequently, the tumor slowly continued to disappear, and now, eight years later, the patient still remains perfectly free from recurrence.

In reply to a question as to whether he knew of any cases of undoubted syphilis which were treated by the toxins, Dr. Coley said that Dr. Robert H. Greene (*Medical News*, October 10, 1896), of this city, has reported ten cases of syphilis treated by this method. Some of them showed decided improvement, while others did not improve at all. The speaker said that in one case of his own where he treated tertiary syphilitic lesions by means of the erysipelas toxins there was no resulting benefit.

TUBERCULOSIS OF THE INTESTINE.

DR. JOSEPH A. BLAKE presented a woman who had entered Roosevelt Hospital in July, 1902. For ten months she had complained of right-sided abdominal pain, and a movable tender mass had been made out in the right iliac fossa. There were no other enteric symptoms. The mass had been regarded by one consultant as a movable kidney. A probable diagnosis of tubercular disease in the neighborhood of the cæcum or chronic appendicitis was made. Operation consisted of an incision, four and one-half inches long, at the border of the right rectus. The tumor was found to consist of a mass of caseous glands at the ileocolic junction, which were firmly adherent to the gut, the process evidently involving it. The cæcum and a short portion of the ileum were excised, the end of the ascending colon turned in, and the end of the ileum united to the colon laterally by means of a Murphy button. Convalescence was uneventful until the twenty-second day after operation. She then complained of severe pain in the left lumbar region, and the following day in the right lumbar region. Both kidneys became enlarged, and were extremely sensitive. Her urine was acid and loaded with pus. There was marked prostration. The temperature rose rapidly, and on the second day of the attack reached 107° F. It continued high, in the neighborhood of 104° , for several days, and finally became normal in ten days, all her symptoms clearing up under the administration of urotropin. The bacteriological examinations of the urine showed only the smegma bacillus. The pathological examination of the specimen removed showed tuberculosis of the glands and infiltration of the wall of the gut, but no tuberculosis of the mucosa of the cæcum or appendix. Evidently there was some tubercular focus elsewhere, probably in the ileum.

The patient has not wholly recovered her strength, but has gained considerable weight and is much improved since the operation, which functionally seems to have been a success.

THE IMPLANTATION OF SILVER FILIGREE FOR THE CLOSURE OF LARGE HERNIAL APERTURES.

DR. WILLY MEYER presented two patients upon whom large hernial apertures had been closed with the assistance of plates of

silver wire filigree. These cases are described in full in the *ANNALS OF SURGERY* for November, 1902, pages 773 and 775.

RESULT OF AN OPERATION FOR TALIPES CALCANEUS.

DR. ROYAL WHITMAN presented a boy upon whom he had operated for talipes calcaneus of paralytic origin. In this variety of club-foot the resulting disability is very marked; the patient's weight rests on the heel, and the remainder of the foot becomes merely an appendage.

The operation recommended for these cases is to remove the astragalus, to remove the cartilage from the bones, to implant the peronei tendons into the atrophied tendo Achillis, or, in the more recent operation, into the os calcis itself, and finally to displace the foot backward upon the leg. The most important part of the operation is the removal of the astragalus, on which the foot is perched. As in most instances the foot is drawn towards a valgus attitude, the transplantation of the peronei tendons not only supplies a certain power of extension, but it removes a distorting force as well.

The result of the operation in the case shown by Dr. Whitman was excellent. The boy has now a solid foot upon which to rest his weight, and the power to move it. He still wears an apparatus, which he will probably be able to discard at the end of a year.

Dr. Whitman said he had performed this operation about twenty times. In the last five cases the tendons were implanted directly through the os calcis.

SOME OBSERVATIONS ON THE DIAGNOSIS AND TREATMENT OF ABDOMINAL CONTUSIONS.

DR. GEORGE EMERSON BREWER read a paper with the above title, for which see the *ANNALS OF SURGERY* for February, 1903.

DR. ROBERT F. WEIR said that in cases of severe abdominal contusion, the surgeon must act promptly and at the same time thoroughly. The speaker said he could corroborate Dr. Brewer's statement as to the marked collapse that occurs as soon as the intra-abdominal pressure is relieved; he attributed the collapse to this fact, rather than to the handling of the abdominal viscera, which, from the difficulty in locating the seat of the injury, a

considerable amount of such handling is often unavoidable. He referred to a case where the left lobe of the liver was so severely injured that it had to be removed; the case resulted fatally, although the patient lived for several days.

In regard to the diagnosis of these cases, Dr. Weir said that, like Dr. Brewer, he felt that the greatest importance should be assigned to the rigidity of the abdominal wall. The condition of these patients is often much worse than their first appearance would lead one to suspect. He has seen ambulant patients with a laceration of the spleen or kidney or other grave lesion. This is, of course, but temporary, graver symptoms generally developing within a comparatively short period thereafter.

DR. BENJAMIN T. TILTON mentioned a case of contusion of the pancreas produced by a blow upon the abdomen, in which there were severe shock and symptoms of hæmorrhage. The man was not in a condition to be operated on, and lived only a few hours. The post-mortem showed a complete transverse rupture of the pancreas right through the centre of the organ, as though it had been cut. There was a large hæmorrhage into the smaller peritoneal sac; some of the blood had found its way through the foramen of Winslow, and both flanks were filled with it.

DR. JOSEPH A. BLAKE said that after abdominal contusions, when muscular rigidity is present, even without or with very slight other symptoms, he has formulated the rule to open and explore the abdomen, and thus far he has not had occasion to regret his action in that respect. The muscular rigidity is present before the onset of peritonitis, and he considered it a most valuable sign.

As regards the location of the incision in these cases, it is frequently a difficult question to decide. Often the best we can do is to make an incision in the linea alba either above or below the umbilicus, and subsequently, if necessary, make a second incision. The speaker said that in a case of ruptured spleen he had been able to treat the injury through a median incision, and then the packing used to control hæmorrhage had been drawn out through a lateral wound.

DR. F. KAMMERER mentioned a case of last summer in which he was called to the hospital to operate on a typhoid patient who had suddenly shown symptoms of perforation. Upon opening the abdomen, he found that very severe hæmorrhage had taken place

from the spleen. The spleen was extirpated as quickly as possible, but the patient only survived the operation by about twelve hours.

Dr. Kammerer said he was rather surprised to hear the statement made by Dr. Brewer to the effect that the collapse became more marked immediately upon opening the abdomen in these cases. The speaker said that had not been his experience. In the case referred to above the abdominal viscera were exposed for fifteen or twenty minutes, during which time the collapse slowly increased; but there was no sudden increase when the abdomen was opened, nor had he ever noticed a sudden increase upon opening the abdomen in other cases of intra-abdominal hæmorrhage, such as extra-uterine pregnancies, for example.

Dr. Kammerer said he would hesitate to give an infusion of salt solution in these cases before finding the source of the hæmorrhage.

Dr. ELIOT said that some three or four years ago, in the Presbyterian Hospital Reports, he published the history of several interesting cases coming under this class, and at that time he emphasized the importance of some of the symptoms mentioned in Dr. Brewer's paper, notably the rigidity and local tenderness, and also the fact that these cases occasionally present themselves in an atypical form. One of the most interesting cases coming under his observation was that of a man, aged fifty years, who had met with a buffer accident, and walked into the dispensary of the Gouverneur Hospital complaining merely of abdominal pain. There was no shock, no rigidity of the abdominal muscles, and an examination elicited only tenderness on pressure in the right lower abdominal region. The man's pulse was 72; his temperature was normal. The case was regarded as one of contusion of the anterior abdominal wall. When Dr. Eliot first saw him, twenty-four hours after the accident, the tenderness above referred to still persisted. On account of the persistence of this symptom, an exploratory operation was advised, but assent was refused. The patient, twenty-four hours later, without any premonitory symptoms, died in sudden collapse. The autopsy showed a small perforation in the lower portion of the ileum.

Dr. Eliot said that while he agreed with Dr. Blake that the median incision was generally the incision of choice, yet in some instances it was preferable to open the abdomen over the point of maximum rigidity. (There is a decided advantage in dealing

with rupture of the right portion of the liver or the spleen through an incision along the outer border of the right or left rectus, respectively. In certain cases of rupture of hollow viscera, also, an incision over the maximum point of rigidity may lead most quickly and directly to the site of rupture, and thereby obviate any prolonged manipulation of the abdominal contents. This had been the speaker's experience in one case of ruptured intestine.

In cases of extraperitoneal rupture of the kidney, there is some difference of opinion as to the expediency of an immediate operation. Many surgeons favor the expectant plan of treatment, and wait for symptoms of shock or secondary infection. In three such cases which came under the speaker's observation, where the diagnosis was based upon the presence of blood in the urine and a retroperitoneal hæmatoma, the expectant plan of treatment resulted very satisfactorily, as neither shock nor secondary infection took place. This method has been recommended by several Continental surgeons. Dr. Eliot said that, according to his experience, extraperitoneal rupture of the kidney was very much more common than the intraperitoneal variety.

DR. BREWER, in closing, said his experience in the treatment of these cases had convinced him that the condition of shock was accelerated by opening the peritoneal cavity. He attributed it to the fact that the pressure upon the bleeding point is relieved when the abdomen is opened and the hæmorrhage recurs.

In reply to Dr. Eliot's remarks regarding extraperitoneal rupture of the kidney, Dr. Brewer said he had treated quite a number of these cases by the expectant method, and they had turned out very satisfactorily. The case of complete rupture of the kidney which he had shown at this meeting, however, was a good illustration of the fact that it is sometimes difficult to decide upon the gravity of the condition with which we have to deal. If that patient had been treated upon the expectant plan, it would probably have ended fatally. Furthermore, an exploratory incision in these cases is not a very serious matter.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, October 6, 1902.

The President, RICHARD H. HARTE, M.D., in the Chair.

INTESTINAL OBSTRUCTION BY FIBROUS BAND, A REMNANT OF MECKEL'S DIVERTICULUM, AND ADHESIONS FROM A FORMER ATTACK OF APPENDICITIS.

DR. WILLIAM J. TAYLOR reported the case of a woman, aged twenty years, who was admitted to St. Agnes's Hospital on December 21, 1901, with a history that there had been no stool for six days, and that for nearly twenty-four hours there had been vomiting, which had become fæcal in character.

She gave a history of having had, a year or so ago, a somewhat similar attack, which was relieved in the course of a few days.

When she was admitted to the hospital her temperature was normal, her pulse good, and there was no marked degree of pain. There was slight abdominal distention, but no marked tympanites. The whole abdomen could be handled freely and deep pressure made all over it without giving special pain.

In view of her general good condition, the stomach was washed out, calomel was given, and several high enemata employed.

The next day, December 22, there was no improvement in her condition. She had passed a poor night, and had kept down a grain of calomel in small doses, but she had vomited several times since the stomach had been washed out.

When Dr. Taylor saw her at half-past eleven, her pulse was weak, not very rapid; the tongue was dry and coated with deep brown fur. There was no special abdominal distention, as it was soft and gave no special pain on deep palpation, and there

was only moderate tympany. She complained of great discomfort across the upper portion of the abdomen.

He opened the abdomen by a median incision and found the omentum adherent to the bladder, intestines, and to the tip of the appendix. The appendix was bound down by many adhesions, and had to be separated with great force from its attachment to the omentum. This was particularly marked at its tip. It was swollen, and showed evidence of former inflammation, but there was no evidence of recent trouble. After freeing it from the adhesions, its removal was easy. The small intestines were constricted at one point, congested, and much distended, but falling short of the appearance of a true peritonitis. The intestines were pulled out of the belly and a careful search made, when it was now found that a band was constricting the small gut. This proved to be a remnant of Meckel's diverticulum arising from the small intestine about thirty-two inches from the cæcum. It was a long cord, a remnant of the diverticulum, which completely encircled the small intestine and passed through a hole in the mesentery; it was then attached to another coil of the intestines, thus firmly binding and constricting the lumen of the gut. This was a single fibrous band one-eighth of an inch in diameter, having no mucous membrane nor lumen. It was ligated with silk and then cut away; the constriction was thus entirely relieved.

The intestine was opened at one point and its contents milked out, there being quite two large basinfuls of fluid fæces. The opening was then sutured with silk, the abdomen was flushed out with salt solution, the intestines replaced, the omentum drawn down over them, and a large glass drainage tube introduced to the bottom of Douglas's cul-de-sac. The abdomen was closed by through-and-through silkworm-gut sutures.

Although everything in the intestines was greatly congested, there was no evidence of long-standing strangulation. The peritoneal covering of the gut was torn in two places during the manipulations.

She stood the operation fairly well, as it was long and necessarily exhausting, for the intestines were out of the abdomen for some time. Her recovery was uneventful, the wound having healed by January 15, less than four weeks.

The cause of the constriction had evidently existed for a long

time, but the strangulation was very recent. While the constriction was absolute, as far as the lumen of the bowel was concerned, it had not blocked the circulation in the bowel, and hence her general symptoms were not those of acute strangulation.

GALL-STONES IN THE COMMON DUCT.

DR. ROBERT G. LE CONTE reported the case of a man, aged thirty-four years, who was admitted to the Pennsylvania Hospital, July 9, 1902. He was a large, strong, well-developed man, although he showed evidence of having recently lost a good deal of weight, estimated by him to be between thirty and forty pounds. He had always had good health until last March, although his life had been one of constant exposure in the coal-mines. In the middle of March he was suddenly seized with excruciating pain which centred in the umbilical region, radiated across the abdomen and up the back to the right shoulder-blade, accompanied by nausea, vomiting, and marked jaundice. He has had about six such attacks during the last four months. In the intervals he has been able to go about, but has not been able to work. No gall-stones have been recovered from the stools. On admission he was free from pain, and felt better than he had at any time since the beginning of his illness. His skin was loose and icteroid; muscles flabby; heart, lungs, and urine negative; abdomen soft, not tender; no enlargement of liver or gall-bladder demonstrable. Leucocytes, 11,800; hæmoglobin, 90 per cent.; no fever. Under phosphate of soda, light diet, and rest in bed the man improved slowly, and was discharged from the hospital at his own request July 28, with the sclera still showing a slight tinge of yellow. The patient was readmitted August 1 during a severe attack of abdominal pain, with vomiting and marked jaundice. He was now quite tender over the gall-bladder region, but no enlargement of the liver or gall-bladder was discernible. The urine showed bile and a trace of albumen, with small bile-stained granular casts. The blood-count showed the leucocytes to be 10,200 and the coagulation time three minutes. The acute symptoms had somewhat subsided by the 6th of August, when, under ether anæsthesia, a four-inch incision was made in the right semi-lunar line over the region of the gall-bladder. The omentum and colon were found firmly adherent to the under surface of the liver and gall-bladder. These adhesions were broken up with some

difficulty and the gall-bladder exposed. It was found to be small, thick, and firm, and could not be brought up into the abdominal incision, so that the operation had to be carried on at a considerable depth from the surface. A longitudinal incision was made in the gall-bladder and a large number of stones, perhaps two or three hundred, of different sizes were withdrawn. They varied in size from a hickory-nut to a No. 8 shot, most of them being small. A few were dislodged from the cystic duct, and two were felt in the common duct, one at the junction of the cystic and common duct and the other about one inch farther on. The first by manipulation was pushed into the cystic duct and removed through the gall-bladder, but the second was found to be immovable. An incision was made in the common duct and this stone withdrawn, and the rent was partially closed with one catgut suture. Only such adhesions were broken up as were necessary to expose the gall-bladder and ducts, the rest being allowed to remain as a protection to the remainder of the peritoneal cavity from possible infection. A few catgut sutures attached the gall-bladder to the fascia and abdominal peritoneum. Gauze drainage was inserted to and around the rent in the common duct and a rubber drainage tube placed in the opening in the gall-bladder. The wound was then closed with silkworm-gut sutures.

The recovery was uneventful. His temperature never reached 100° F.; there was a free flow of bile on the dressing, and the stools resumed their normal color. The gauze packing about the common duct was removed in forty-eight hours, and two days later the rubber tube was taken from the gall-bladder. The stitches were removed on the eighth day and the wound found well healed. At the end of two weeks the amount of bile on the dressing was perceptibly diminished. He left the hospital, September 9, with a small sinus, which discharged, perhaps, a drachm of colored mucus in twenty-four hours. One week later he again returned to the hospital with the sinus infected and a free discharge of pus. Under treatment this speedily improved, and the sinus permanently closed in two weeks' time. During these two weeks he had one annoying symptom, viz., almost every midnight he would vomit the contents of the stomach without nausea. The vomitus consisted of food that had completed gastric digestion with a slight mixture of bile. The reporter called attention to two points in the report of this case:

First. Closure of the common duct by suture. While he advocated its closure whenever possible, he said that in some cases the duct is so rigid and thickened with inflammatory material, and perhaps also so deeply placed from the abdominal surface, that it is nearly impossible to pass sutures unless the abdominal wound is very greatly enlarged, and even then the walls of the duct may be so friable that the sutures will tear out. He thought that it did not make much difference if the incision in the duct was left open, provided the opening is well surrounded with gauze. The wound of the duct will always close before the opening in the gall-bladder has ceased to drain.

Second. In those cases where the opening is not immediately closed by sutures, should all the adhesions among the surrounding organs be broken up? When the bile-tracts are sterile, it probably makes no difference whether these adhesions are thoroughly broken up or not; but when there is a possibility of infection, it would seem that only such adhesions should be separated as are necessary to expose these parts properly, and that the remainder around the pylorus, the duodenum, and the transverse colon should be left untouched as an additional barrier to a possible general infection of the peritoneal cavity.

DR. ALLIS thought the question regarding the closure of the common duct a very pertinent one. Even if fine catgut and a very small needle be used, there is danger of infection from entering the mucous membrane when closing the duct. If the duct be thickened, as is generally the case in these instances, the incised part will be held in place by gauze without suturing.

DR. W. L. RODMAN thought that Fenger had fully demonstrated that an incision in the common duct need not be closed in all cases. So long as the bile is aseptic, closure is not necessary. Suture of the common duct is one of the most difficult tasks in surgery. This summer he saw Mr. Robson operate and close the duct with great facility. The abdominal incision was made in the right semilunar line with a curve at the upper end. With a bag under the patient's back, the liver and gall-bladder were delivered in the most perfect manner. By this method the duct was comparatively easy of access.

DR. JOHN H. GIBBON referred to a case operated upon two days previously for gangrenous cholecystitis.

The patient was a woman fifty years of age, who gave a

history of having suffered from attacks of indigestion and vomiting. She was taken ill three days before admission to the Polyclinic Hospital. At the time of admission there was palpable a tumor in the right side of the abdomen considerably below the costal border; there was marked rigidity of the abdominal wall on this side; frequent vomiting occurred; the patient's temperature was 102° F.; and the leucocyte count made the morning after her admission was 37,000. The abdomen was opened at this time and some free fluid found in the gall-bladder region. The gall-bladder itself was covered by an adherent omentum, which, when removed, showed a distended and gangrenous gall-bladder. When incised, the gall-bladder was found to contain a large amount of pus possessing a very foul odor. A large stone was found firmly fixed at the mouth of the cystic duct. The mucous membrane of the entire gall-bladder was gangrenous and about one-third of all the coats near the fundus. The gall-bladder was easily separated from the liver, and when an attempt was made to pass a ligature about the cystic duct the gall-bladder separated and came away. The cystic artery bled furiously, and could not be controlled by a hæmostat, as the instrument cut through the inflamed tissues; the bleeding was then controlled by gauze packing. The patient was very ill after the operation, but recovered, and the day following the leucocyte count had dropped to 12,000, the vomiting had ceased, and the patient's bowels had moved freely. The second day the patient was in good condition, the temperature having fallen, but the leucocyte count had again gone up to 20,000.

AMPUTATION OF THE LEG DONE UNDER LOCAL AN- ÆSTHESIA PRODUCED BY THE INTRANEURAL INJECTION OF COCAINE.

DR. JOHN H. GIBBON, in reporting this case, referred to Crile's paper on the use of cocaine and eucaïne (*Journal of American Medical Association*, February 22, 1902). Crile conducted a number of experiments upon animals in order to learn the effect of intraneural injection of cocaine and eucaïne. He discovered that such injection resulted in an absolute block to both afferent and efferent impulses, and that consequently no shock resulted from operation upon the parts supplied by the nerve. These experiments were confirmed by subsequent clinical experience.

After injecting the sciatic and anterior crural nerves with a 1 per cent. solution of cocaine, he was able to perform an amputation of the leg not only without pain, but without the patient's knowledge, with only one exception in five cases. The exceptional case, hearing the saw passing through the bone, realized what was being done. Crile states that it is the afferent impulses from injury or operation which produces shock, and that these impulses are but slightly influenced by a general anæsthetic. Afferent impulses producing pain are abolished by a general anæsthetic, and those affecting vasomotor, respiratory, and cardiac mechanisms are not. Crile describes this injection of the nerves as a physiological amputation of the part. Matas has also done considerable work in this line with equally satisfactory results.

The case reported by Gibbon is that of a man fifty years of age, who was admitted to the hospital suffering from a tuberculous ankle-joint. The man was extremely thin and wasted. Because of the patient's age, his general condition, and the far advanced disease of the bones, it was thought inadvisable to attempt any other than a radical operation. The sciatic and anterior crural nerves were exposed under infiltration anæsthesia, and each nerve injected with a 1 per cent. solution of cocaine. Anæsthesia in the parts supplied by these nerves was not immediate, and, in fact, it was feared for a while that no anæsthesia would be produced, but in about eight minutes the patient experienced no pain when the ankle-joint was opened for the purpose of inspection. Prior to the operation, the patient was given a hypodermic of morphia and atropia, and during the operation one of the house staff engaged him in conversation. The amputation was quickly performed and without the patient's knowledge. Subsequent to the operation there was no evidence of shock whatever, excepting a slightly increased pulse-rate. He suffered little pain in the part after the operation, and the wounds healed promptly. The patient was discharged from the hospital about a month after the operation, showing no effects from the injection of the nerves with the cocaine solution.

DR. R. G. LE CONTE said he was present during the operation, and could corroborate the statement that there was no pain felt by the patient during the amputation. He would offer in explanation of the increased pulse-rate the fact that a perceptible quantity of cocaine had been used and absorbed. He mentioned

the case of a man, about to go on a coaching trip, from whose scalp he removed a wart after injecting a small amount of a 4 per cent. solution of cocaine. The man was greatly exhilarated thereby, and when he reached the coaching party the other members thought he was intoxicated. The stimulation of the pulse in the case under discussion might probably be due to the cocaine instead of being a nervous phenomenon.

INJURIES AT THE HIP IN AGED PERSONS.

DR. OSCAR H. ALLIS read a paper on the above subject, for which see *ANNALS OF SURGERY* for February.

DR. RICHARD H. HARTE concurred in all that Dr. Allis had said with regard to the sometimes anomalous conditions which occur about the neck of the thigh-bone after fracture. He had often been struck with the amount of pain and inability to move the joint, even after it had been at rest for a very considerable length of time. These conditions were due, as Dr. Allis had pointed out, to three or four causes: There may be a large number of spicula, which are sources of irritation and pain, and which often remain there as foreign bodies until they are absorbed and again replaced, frequently, by new growths from the periosteum, forming many of the large mass of osteophytes which are so often seen in specimens after fracture of the neck of the thigh-bone. Again, it is not an uncommon thing to have extensive inflammation started up, either of the character of a synovitis or an osteitis. Again, many of the specimens are frequently denuded of their cartilage, showing that a very extensive inflammatory process has been going on. This in one sense is responsible for a great deal of the loss of function which is so apparent in many of these joint injuries, and which is always characteristic of every joint inflammation. Where pain and inability to move the joint persist, and there is no contraindication to it, it is good surgery to open the joint and remove the end of the bone and any other irritating fragments which may be in the capsule or in relation with the fracture. Of course, this must be governed by the age and the condition of the patient.

DR. ROBERT G. LE CONTE said that one case recently under his care might possibly help bear out the statements of Dr. Allis, which he fully endorsed. The patient was a woman who one year ago fractured the neck of her right femur. Since that time

she had been perfectly helpless and had suffered great pain. She had also been for many years a great sufferer from rheumatic gout or arthritis deformans. Operation was undertaken ten months after the injury with the idea of freshening the ends of the bone and pegging them. When the femur was exposed, it was found that the neck had been almost entirely absorbed. The head showed eroded areas similar to those mentioned by Dr. Allis. The head of the bone was excised to relieve the pain. At the end of six weeks the patient was about on crutches, and continues in comparative comfort with the exception of the knee of the same side, which gives great pain on account of the arthritis deformans. The pain in the hip is absolutely relieved.

DR. W. J. TAYLOR said that the pain in these cases was probably largely due to arthritis set up by traumatism. An old lady of eighty-two had recently been under his care, but she was one of the more fortunate cases. She fell and sustained an impacted fracture of the neck of the femur, there being two and one-half inches of shortening. The X-ray shows a spicule of bone near the neck of the femur, but it is impossible to say where it came from. The patient, however, has had very little pain, and none since the first week. She remained in bed three weeks with light extension. She now walks around the house and even up and down stairs, the main difficulty resulting from the marked shortening of the affected side. No true arthritis was caused in this case, and the patient's general health has not suffered.

DR. G. G. ROSS related a case of which he had personal knowledge, that of an old lady who sustained an intracapsular fracture of the hip when she was 102 years of age. She recovered, and was able to walk afterwards with considerable ease, living until she was 106.

EDITORIAL ARTICLE.

MOYNIHAN ON RETROPERITONEAL HERNIA.¹

THIS volume contains the lectures which, as Arris and Gale lecturer, Mr. Moynihan delivered before the College of Surgeons. As he states, the subject has received less than adequate attention from English surgeons in the past. This is largely due to the supposed rarity of retroperitoneal hernia. Mr. Moynihan is emphatic that the condition is not one of exceptional rarity, from the number of cases which he has found recorded, together with some specimens hitherto undescribed in the London museums. The obscurity which has hitherto surrounded these conditions, the difficulty in dealing with them at the time of operation, the fact, as is repeatedly shown by Mr. Moynihan, that these retroperitoneal herniæ may quickly end lives hitherto absolutely healthy, —these points abundantly justify our desire to make Mr. Moynihan's accurate and exhaustive work on the subject more widely known.

The first chapter deals with the development of the intestinal canal and peritoneum, and certain of the abdominal organs.

The second gives a detailed account of the duodenal folds and fossæ, and the herniæ which are met with here.

In the third chapter we have an equally full and minute relation of the peritoneal folds and pouches in the neighborhood of the cæcum and vermiform appendix.

The fourth and fifth chapters are devoted to the intersigmoid fossa and foramen of Winslow respectively and the herniæ which may occur in each.

¹ RETROPERITONEAL HERNIA. By B. G. A. MOYNIHAN, M.S., F.R.C.S., Assistant Surgeon, Leeds General Infirmary. London: Bailliere, Tyn-dall, and Cox, 1899.

While each of these chapters is exhaustive in the way in which each subject is dealt with, it is the second which must be looked on as the most important, owing to the greater frequency of duodenal herniæ; the fourth and fifth are comparatively brief, owing to the rareness of herniæ into the intersigmoid fossa and foramen of Winslow.

THE DUODENAL FOLDS AND FOSSÆ.

Mr. Moynihan begins by clearing his ground with a reference to the redundant nomenclature adopted by various writers. The term which has been most indiscriminately and inaccurately employed is "duodenojejunal." While it must be confessed that it is a very difficult matter to find an exactly suitable term for such fossa, and while alternative titles are given in almost every instance, the one placed first in each case by Mr. Moynihan is in his opinion the aptest, and he points out that much perplexity would, in future, be avoided if that title could alone be accepted.

History of the Fossæ.—As would be expected, the chief credit of our knowledge here is given to Treitz ("Hernia Retroperitonealis," *ein Beitrag zur Geschichte der inneren Hernia*, Prag, 1857). He says, "If in a body with a normal peritoneum one lifts up the great omentum and the transverse colon, and pushes over to the right the mass of small intestines, there will be seen on the left side of the duodenojejunal flexure a peritoneal fold. This varies in shape and size. Most frequently it is semilunar, the thin concave edge looking upward and to the right (of the subject) and surrounding the bowel at the level of the flexure. The upper horn of this semilunar fold is blended with the inferior layer of the transverse mesocolon, and especially at the point where the inferior mesenteric vein passes beneath the pancreas. The larger lower horn is continuous on the inner side with the peritoneal investment of the duodenum, and at the outer end with the peritoneum of the transverse and descending colon. In the upper horn, at a variable distance from the edge, lies the inferior

mesenteric vein, forming an arch with the convexity looking upward and to the left. The lower horn is less distinct, composed exclusively of two layers of peritoneum, and, at some distance from its free border, one sees the inferior mesenteric artery and its branch, the left colic. From the relative position of these two vessels there results a vascular arch (always referred to now as the arch of Treitz) which surrounds the fold in question. Behind this peritoneal fold—between it and the duodenum—there exists necessarily a depression or pocket in the form of a funnel, the summit of which is directed towards the duodenum. The orifice of entrance is semilunar, limited on the right by the flexura duodenojejunalis; on the left by the free border of the fold. The fossa is, in general, situated on the left side of the third lumbar vertebra.”

It is of practical importance to note that Waldeyer (“*Hernia Retroperitonealis*,” Breslau, 1868) found this duodenojejunal fossa of Treitz to be present in 73 per cent. of 250 cases consecutively examined. Its size varied considerably, being sometimes capable of containing only the terminal joint of the index-finger, sometimes as much as twelve or eighteen inches of small intestine.

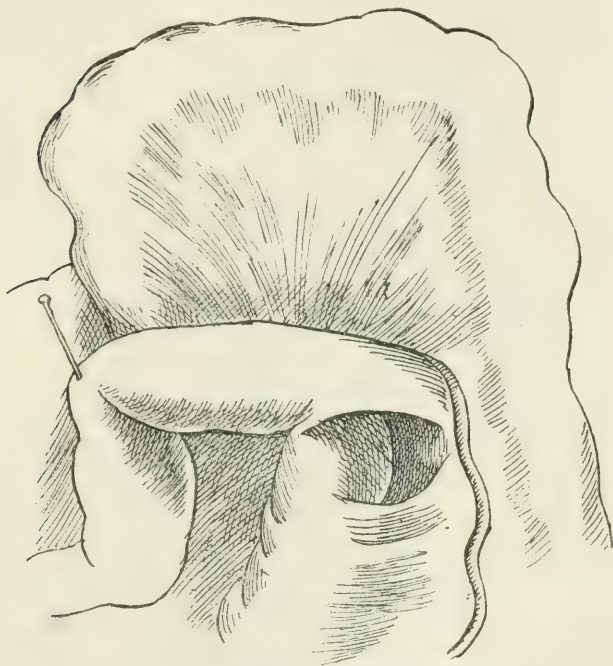
Folds and Fossæ.—It is pointed out that from the time of Treitz the number of duodenal fossæ discovered has been increasing. Mr. Moynihan, with much minuteness, describes the following nine:

1. *The Superior Duodenal Fossa.* 2. *The Inferior Duodenal Fossa.* 3. *The Posterior Duodenal Fossa.* 4. *The Duodenojejunal Fossa.* 5. *The Intermesocolic Fossa.* 6. *The Infraduodenal Fossa.* 7. *The Paraduodenal Fossa, or Fossa of Landzert.* 8. *The Mesentericoparietal Fossa, or Fossa of Waldeyer.* 9. *The Parajejunal Fossa of Brösike.*

Only the more practical anatomical points will be dealt with here, so that the clinical aspect of duodenal herniæ may be more fully dealt with later on.

1. *The Superior Duodenal Fossa*, or upper horn of the Fossa of Treitz (Fig. 1). This is present in from 40 to 50 per cent. of cases. It may exist alone or be present with the inferior duodenal fossa. It lies to the left of the ascending portion of the duodenum, near its termination. The orifice looks downward, opposing the mouth of the inferior duodenal fossa. The apex extends upward

FIG. 1.



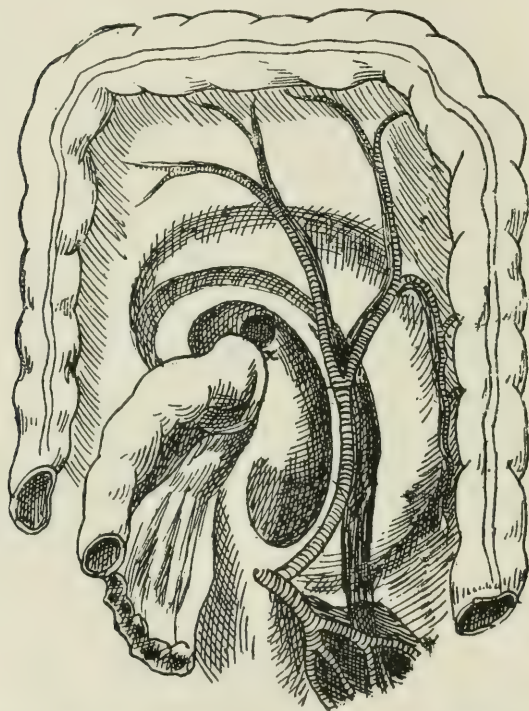
The superior and inferior duodenal folds and fossæ.

to the body of the pancreas. It is bounded in front by the *superior duodenal fold*, presenting a lower free margin, whose inner end is blended with the peritoneum on the front of the duodenum; the outer being lost on the mesocolon, near the junction of the transverse and descending bowel, in front of the left kidney. The upper part of the fold is continuous with the transverse mesocolon. The line of union of the superior duodenal fold with the

descending mesocolon corresponds, as a rule, almost exactly with the inferior mesenteric vein.

2. *The Inferior Duodenal Fossa*, or Fossa of Treitz (Fig. 1). This is the most frequent of all the peritoneal fossæ found in this region. It exists, more or less well defined, in from 70 to 75 per

FIG. 2.



Paraduodenal fossa, or fossa of Landzert, and posterior duodenal fossa.

cent. of cases. In its typical form it may be thus described. It is situated on the left side of the ascending portion of the duodenum, opposite the third lumbar vertebra. The orifice looks almost directly upward, the fundus inclines downward, practically always to the right, to the root of the mesentery. The fossa is bounded in front by the *inferior duodenal fold*. The upper margin of this

is sharp: its inner end is lost on the anterior surface of the duodenum, the outer blends with the peritoneum covering the posterior wall of the abdomen. To the right of the fossa is the ascending portion of the duodenum, behind it is the parietal peritoneum covering the third lumbar vertebra. In certain cases, it is said, the inferior mesenteric vein may be found on the free edge of the orifice; when the vein takes this course, it may have the left colic artery encircling it spirally.

3. *The Posterior Duodenal Fossa*, or Fossa of Gruber (Fig. 2). This fossa was seen by Gruber (*Zur Hernia Interna*, St.

FIG. 3.



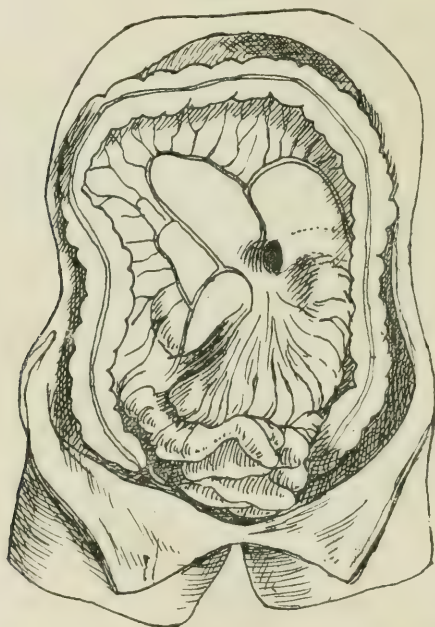
The duodenojejunal fossa.

Petersburger Medicinische Zeitung, 1802, Band ii), after the emptying of the sac of a left duodenal hernia, lying behind and to the right of the mouth of the sac. Brösike, of Berlin, gave this fossa the name "*Recessus duodenojejunalis posterior*," because "in the normal position of the gut the fossa lies immediately behind the flexure." Mr. Moynihan considers it more correct to say that the fossa lies immediately behind the upper portion of the ascending limb of the duodenum. The fossa is bounded in front by the duodenum, and behind by the parietal peritoneum covering the lumbar vertebræ. To the right is a fold of peri-

toneum containing the muscle of Treitz. To the left lies a fold running between the parietal peritoneum and the left side of the ascending duodenum. One point of great importance with regard to this fossa is that its highest degree of completeness is only found in association with the paraduodenal fossa. The cases of Gruber and Landzert (Fig. 2) are therefore the more readily understood.

4. *The Duodenojejunal Fossa* (Fig. 3). On dragging the transverse colon upward and the jejunum downward to the right,

FIG. 4.



Recessus intermesocolicus transversus, intermesocolic fossa, or fossa of Brösike.

there can be seen at the root of the transverse mesocolon a fossa which results from the plunging as it were of the duodenojejunal flexure into the root of the transverse mesocolon. It is found in about 15 to 20 per cent. of the bodies examined. Laterally, it is bounded by two folds; in reality, the continuations backward of

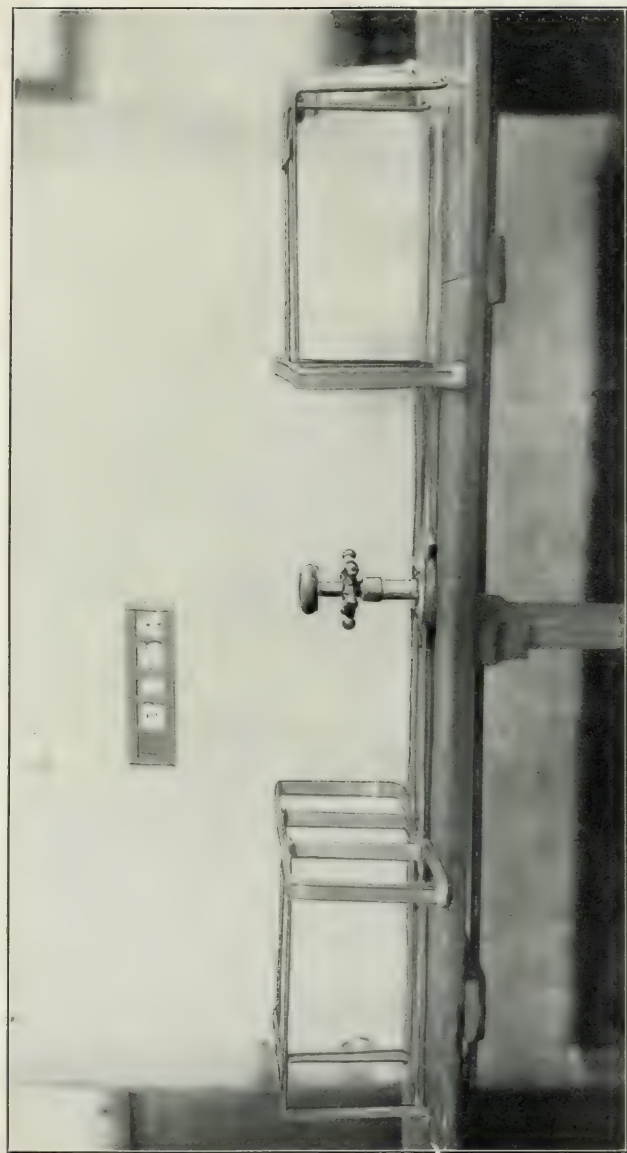


FIG. 1.—Dr. J. D. Bloom's apparatus, showing extreme recession of jack-screw. The iron frames on which rest the pelvis and shoulders are made more comfortable by having a square of card-board laid upon them.

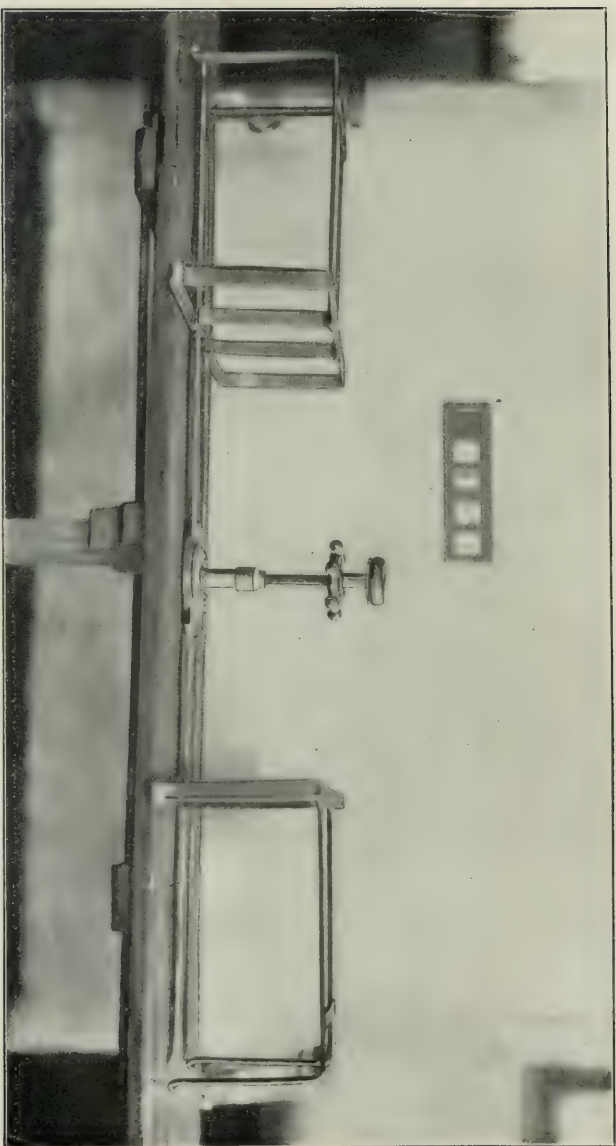
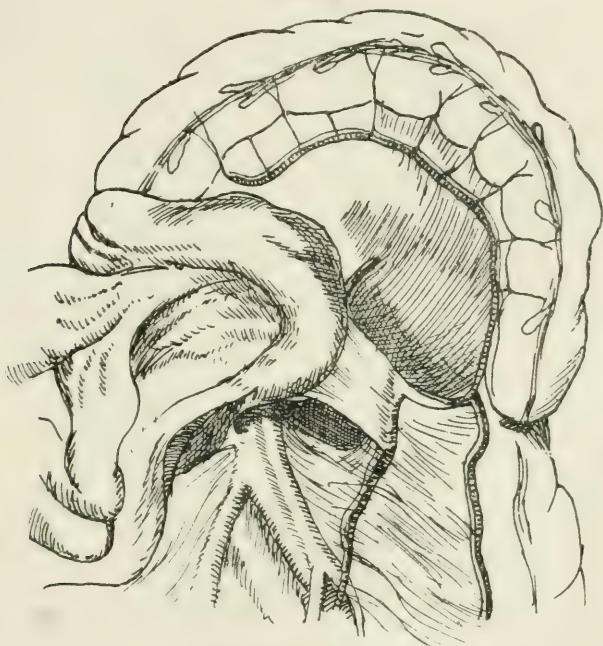


FIG. 2.—Dr. J. D. Bloom's apparatus, showing extreme extension of jackscrew.

the two leaves of the mesentery, which, skirting the duodenojejunal flexure, unite above it in a semilunar fold, whose edge looks downward and to the right. The fossa is bounded above by the pancreas, to the right by the aorta, to the left by the kidney. In the floor lies the left renal vein. The inferior mesenteric vein running upward and to the right forms a concavity, which corre-

FIG. 5.



The infraduodenal fossa.

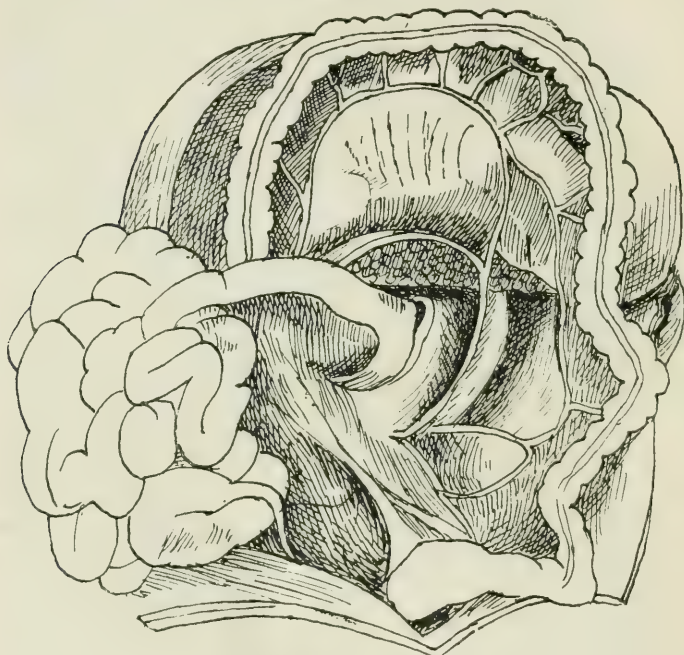
sponds fairly accurately to the upper limit of the fossa. Where this fossa is found, there never yet has been seen any other form of duodenal fossa.

5. *The Intermesocolic Fossa of Brösike* (Fig. 4). This fossa is rare. Mr. Moynihan has only seen it once. Brösike, who first described it, has met with it six times. It runs in the root of the transverse mesocolon. The upper wall is formed by the transverse mesocolon and pancreas, the lower by the duodenojejunal

flexure, the anterior wall by a fold of peritoneum uniting the under surface of the transverse mesocolon with the flexure. The middle colic artery lies near the opening to the right.

6. *The Infraduodenal Fossa* (Fig. 5). The orifice of this fossa looks downward, its apex reaches the duodenojejunal angle,

FIG. 6.



The paraduodenal fossa.

the muscle of Treitz, and the pancreas. It is bounded in front by the back of the transverse and ascending portions of the duodenum; behind by the aorta, which projects into the cavity of the fossa, and, laterally, by two serous folds—duodenoparietal—which pass between the duodenum and posterior parietal peritoneum on each side of the aorta.

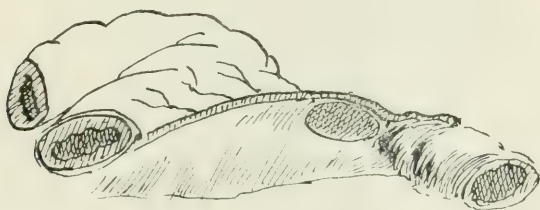
7. *The Paraduodenal Fossa*, Fossa of Landzert (Figs. 2 and 6). This fossa exists not seldom in conjunction with others. In

its typical form the fossa may be thus described. It is caused by the raising up of a fold, the plica venosa, by the inferior mesenteric vein. The fossa is situated to the left, and some distance from the ascending limb of the duodenum. Behind, the sac is bounded by the parietal peritoneum covering the psoas, the renal vessels, the ureter, and a portion of the left kidney. The orifice of the sac is wide and looks to the right.

This fossa is of much practical importance, as it forms, according to Mr. Moynihan, the sac of a left duodenal hernia. Of these, as we shall see, the above authority has collected no less than fifty-seven examples.

8 and 9. *The Mesentericoparietal and Parajejunal Fossæ* (Figs. 7 and 8). Mr. Moynihan takes these together, as, in his

FIG. 7.



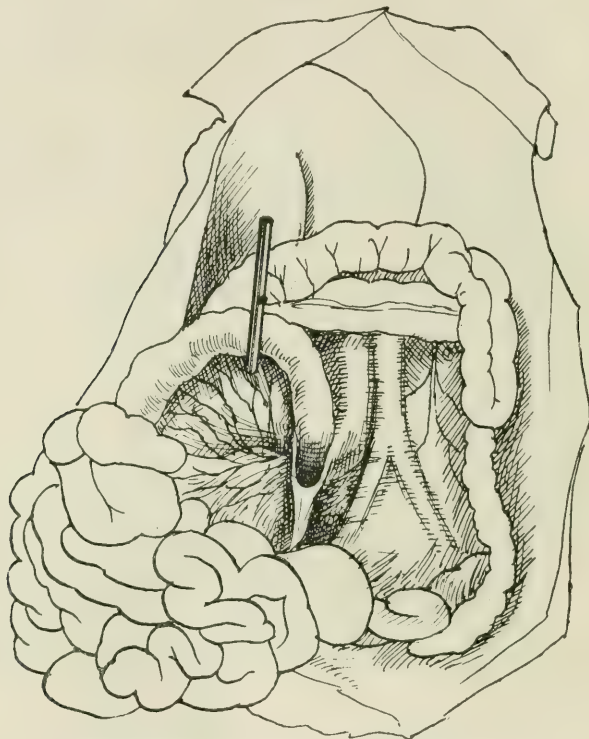
The fossa of Waldeyer, lying behind the superior mesenteric artery and below the duodenum.
The mesentericoparietal fossa.

opinion, they are practically the same fossæ under different conditions. The superior mesenteric artery arching downward with a slightly concave curve to the right raises a fold of peritoneum, and in the concavity of this arched fold a fossa may exist. Its most usual position is in the first part of the mesojejunum, immediately behind the superior mesenteric artery, and immediately below the duodenum. The orifice looks to the left, the fundus to the right and downward; in front it is bounded by the superior mesenteric artery, and behind by the lumbar vertebræ.

The chief interest of this fossa lies in the fact that both Waldeyer, who was one of the first to describe it, and Mr. Moynihan

consider it possible that, from its relation to the mesentery, it may explain some of those cases of hernia into or through rents in the

FIG. 8.



Fossa parajejunalis of Brösike, showing jejunal adhesion.

mesentery, one such case of "mesenteric hernia" having been described by Sir A. Cooper as long ago as 1807.

DUODENAL HERNIA.

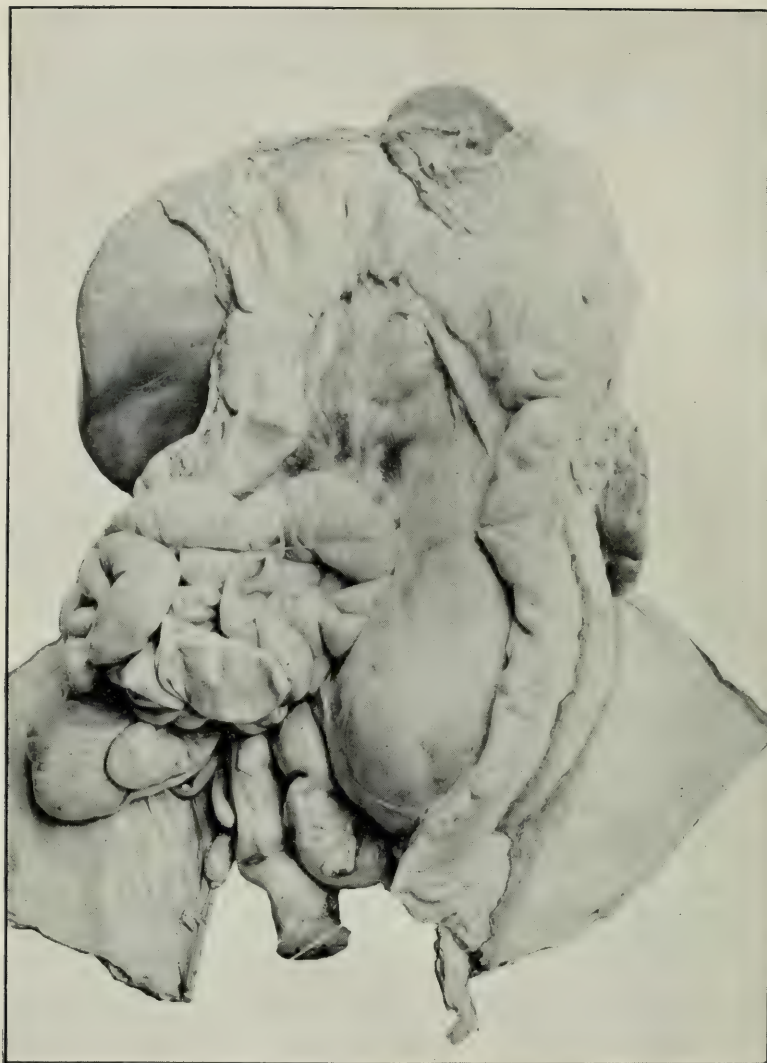
This is of two kinds. In the first, and commonest, the hernial sac increases to the left of the middle line, in the second to the right. In both cases there may be an upward and downward increase, but the essential difference between the two forms lies in the varying direction of their lateral deviation. The term at pres-

PLATE I.



Left duodenal hernia. (Specimen 1279, St. Thomas's Hospital Museum.) A specimen showing a hernia of the jejunum into the fossa paraduodenalis. The colon has been raised to expose the small intestine, which has been filled with plaster of Paris. The mouth of the sac is about six inches in diameter, and lies immediately below the termination of the duodenum, the intestine within it comprising the highest coils of the jejunum. The contents were readily removable from the sac after death; the hernia was found accidentally in a child. Of this preparation, Mr. Moynihan says, "This is the most beautiful specimen of a left duodenal hernia in the early stage which I have met with. In the margin of the orifice the inferior mesenteric vein is distinctly seen."

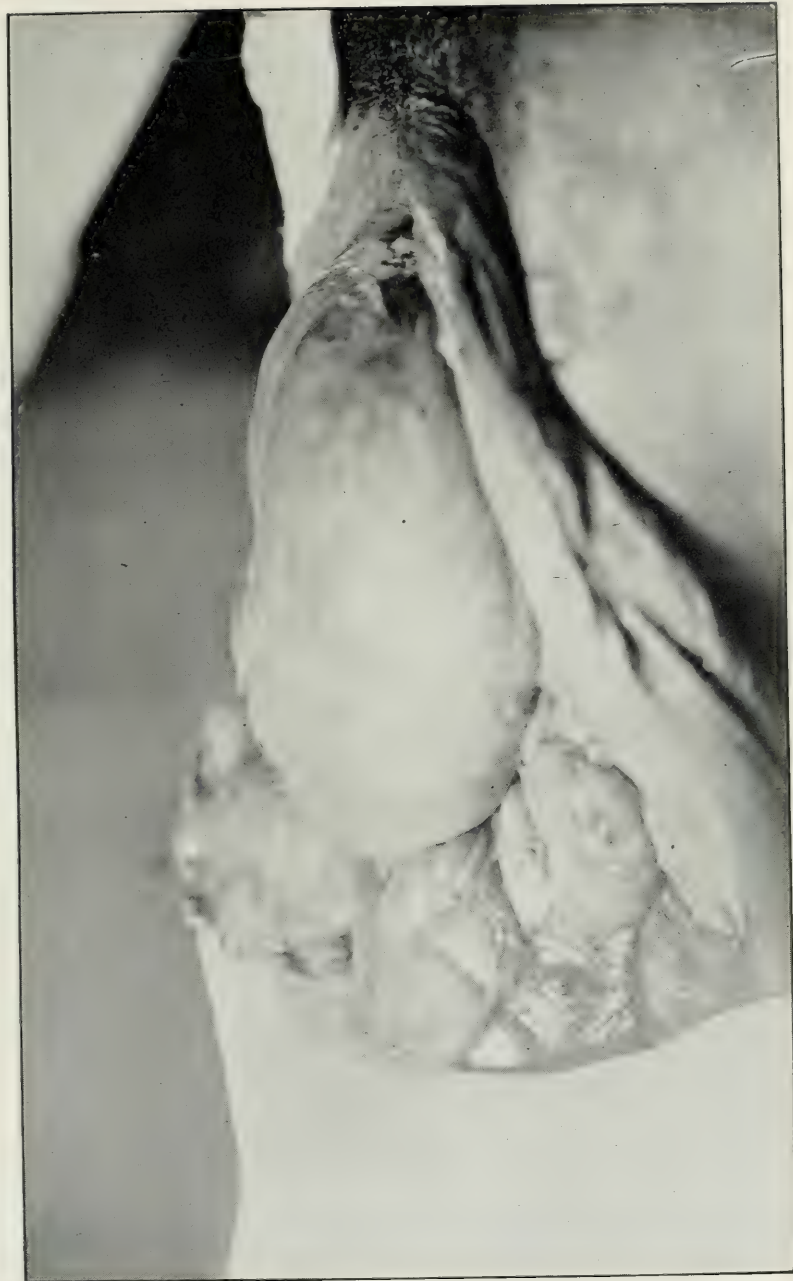
PLATE II.



Left duodenal hernia. (Dr. Griffith's case.) From a female child, aged thirteen months. Death from catarrhal pneumonia, following measles.

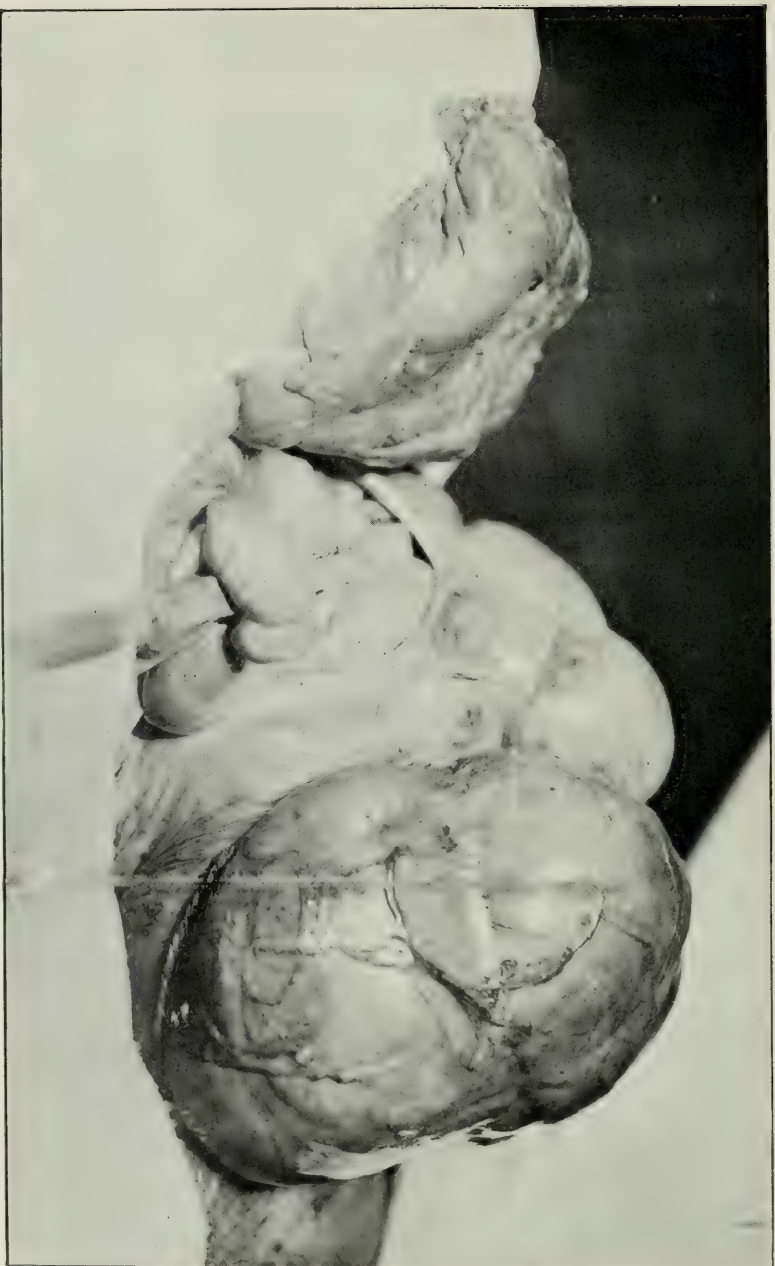
On opening the abdomen, it was found that the greater part of the ascending colon was covered behind by peritoneum, so as to lie between the two layers of the mesentery. To the left of the abdominal cavity a sac containing bowel was seen. This sac was about four and one-half inches long, and three and one-half inches in the transverse diameter, and extended from the middle line, where the entrance was placed, to the outer side of the descending colon. A short descending mesocolon was present. In the vertical direction the sac reached from the pancreas to a little below the brim of the pelvis. The sac contained rather more than half the intestine. On removing the bowel from the sac, three small descending intussusceptions were seen. The orifice of the sac, which looked directly to the right, admitted four fingers. The edge was very sharp, and contained the inferior mesenteric vein and the ascending branch of the left colic artery. The duodenojejunal flexure lies in the sac at the upper and inner extremity. The inferior duodenal fold is present, though small, and not as acutely defined as it generally is in children. No symptoms were present during life.

PLATE III.



Left duodenal hernia, showing sac as it appeared on opening abdomen. (Case of Dr. L. Mitchell, of Chicago.) The patient, a woman aged thirty years, had been shot. At the autopsy, instead of coming upon the omentum or intestine, a white glistening sac like a mesenteric cyst or ovarian tumor was found. This was surrounded by the colon. The omentum was rolled up between the sac and the transverse colon. At the lowest aspect of the sac on the right was an elliptical opening, from which the lower part of the ileum escaped to join the caecum. The rest of the small intestine was contained within the sac. The inferior mesenteric vein bordered the orifice of the sac, being about the size of a goose-quill. The colica sinistra artery ran at some little distance from the free border. Only a part of the coils of intestine could be pulled out, the rest being strongly adherent to the sac.

PLATE IV.



Left: inguinal hernia, showing sac and contents lifted up, with stake passed under ileum as it left sac. (Case of Dr. L. Mitchell, of Chicago.) The patient, a woman aged thirty years, had been shot. At the autopsy, instead of coming upon the omentum or intestine, a white glistening cyst or ovarian tumor was found. This was surrounded by the colon. The omentum was rolled up between the sac and the transverse colon. At the lowest aspect of the sac on the right was an elliptical opening, from which the lower part of the ileum escaped to join the cecum. The rest of the small intestine was contained within the sac. The inferior mesenteric vein bordered the orifice of the sac, being about the size of a goose-quill. The colica sinistra artery ran at some little distance from the free border. Only a part of the coils of intestine could be pulled out, the rest being strongly adherent to the sac.

ent in most common use is "duodenojejunal hernia," which has nothing whatever to recommend it; for it is intended to convey the idea of the origin of the hernia in the inferior duodenal fossa, a state of things which never occurs; and into the fossa which Jonnesco and Mr. Moynihan have termed "duodenojejunal," there is only one case on record, and that a doubtful one. For every reason, then, the author claims that the terms "right duodenal hernia" and "left duodenal hernia" are abundantly justified.

LEFT DUODENAL HERNIA. (PLATES I, II, III, IV, and FIG. 9.)

Point of Origin.—With his usual minuteness of detail, Mr. Moynihan rejects all the fossa save one, and that is the paraduodenal fossa, or fossa of Landzert (Figs. 2 and 6). With regard to the inferior duodenal fossa, or fossa of Treitz, it was long supposed—and still the belief is universal—that all forms of duodenal herniæ originate in this fossa. Treitz himself taught this, and later authors have implicitly accepted his view. Mr. Moynihan differs on this ground. The typical inferior duodenal fossa, as he has shown, is non-vascular; the orifice of a duodenal hernial sac is always vascular. In the neck of such a sac can always be seen the inferior mesenteric vein (Plate I). The left colic artery may be closely applied to it, or it may be some little distance away. The two are very distinctly shown in a preparation described by Dr. Pye-Smith, Specimen 1084, Guy's Hospital Museum. But of the position of the inferior mesenteric vein in all the specimens Mr. Moynihan has examined there is no doubt whatever; of all points, the vein is the one of chiefest importance. The fold containing the vein is the plica venosa, and the fossa bounded by such a fold is the paraduodenal fossa, or fossa of Landzert. It is this fossa then that, so far as our present knowledge goes, forms the sac of a left duodenal hernia. The formation of such a hernia in the superior duodenal or the duodenojejunal fossa is not denied; it is, however, exceedingly unlikely.

Conditions predisposing to the Hernia.—Treitz enumerated

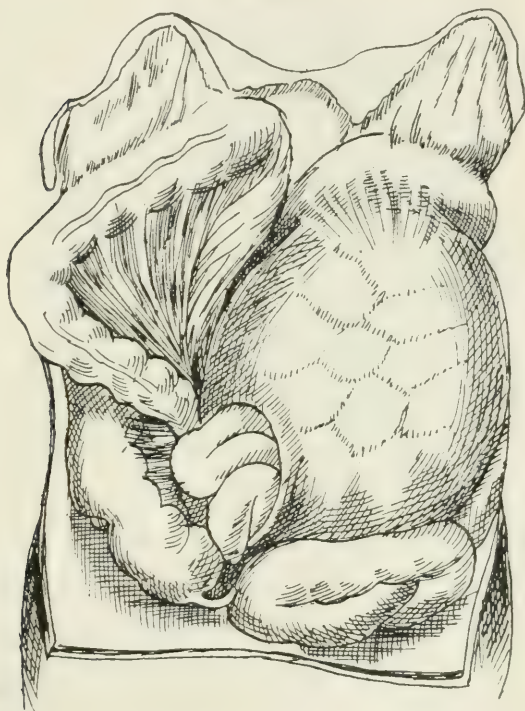
the following three as essential for the formation of a duodenal hernia: (1) The existence of a fossa and its boundary-fold; (2) the presence of the inferior mesenteric vein in the fold; (3) sufficient mobility of the small intestine to admit of its introduction into the sac formed at the expense of the fossa.

Mr. Moynihan gives the following characteristics as invariably present in a left duodenal hernia: (1) The presence of the inferior mesenteric vein in the neck of the sac. The extent of the margin actually formed by the vein varies somewhat. In all, however, for a greater or less distance, generally greater rather than less, the vein is present and quite easily recognizable (Plate I); for a portion of the distance it is usually placed in close relationship with the left colic artery. (2) The hernia spreads either outward towards the descending mesocolon or upward into the transverse mesocolon, or both. (3) The hernial sac consists of a single layer of peritoneum. In its expansion away from the spine, the sac will rest behind on the various structures placed on the posterior abdominal wall. In front of it will be the posterior parietal peritoneum, more or less closely united to the sac-wall. The hernial contents have, therefore, two layers of peritoneum in front of them and one behind.

The Neck of the Sac.—As a general rule, the orifice of the sac is situated at the back of the hernia, close to the lumbar vertebræ. In the smaller herniæ it is situated to the right of the hernial mass, and looks slightly to the front. As the mass of bowel contained within the sac increases, the relative position of the orifice becomes altered, being situated to the right and increasingly posterior. In a large hernia it is necessary, in order to expose the neck of the sac, to drag it well over to the left side. The orifice is then seen close to the third lumbar vertebra. As the herniæ increase in bulk, the vertical diameter increases until eventually the sac may extend quite down to the region of the cæcum (Fig. 9). The orifice is bounded behind by the posterior parietal peritoneum. The upper, anterior, and lower boundaries of the opening are

formed by the plica vasculosa (*vide supra*). The left colic artery is generally closely applied to the inferior mesenteric vein throughout the whole of the anterior portion of the fold. At the mouth of the sac is always seen that part of the intestine which is leaving

FIG. 9.



Treitz's case of left duodenal hernia.

the sac to be continuous with the small intestine, if any, between the sac and the cæcum.

The Size of the Hernia.—This varies enormously,—in some cases no larger than a walnut, in others it practically fills the whole abdomen. Several of the smaller specimens have been observed in necropsies performed on children (Plate I). The majority of the cases recorded are those of herniæ where the whole or the

larger part of the small intestine lay in the sac, and the patients at or well beyond adult age.

Relations.—These when the hernia is small are as follows. It rests on the psoas, the inner portion of the kidney, and renal vessels; above, it may reach the pancreas. When the hernia is reaching larger dimensions, its position depends on the degree of development of the descending mesocolon. If this be little developed or absent, a hernia will push the colon at first outside. The hernia is situated in the middle of the abdominal cavity, and the colon surrounds the mass. If the mesocolon be more or less complete, this structure will be “used up” by the oncoming hernia, and its layers will be spread out on the anterior wall of the sac. The subsequent enlargement of the sac pushes the descending colon downward and to the right. The splenic flexure is then approximated to the cæcum. Under all circumstances the relative positions of the cæcum and ascending colon remain unchanged.

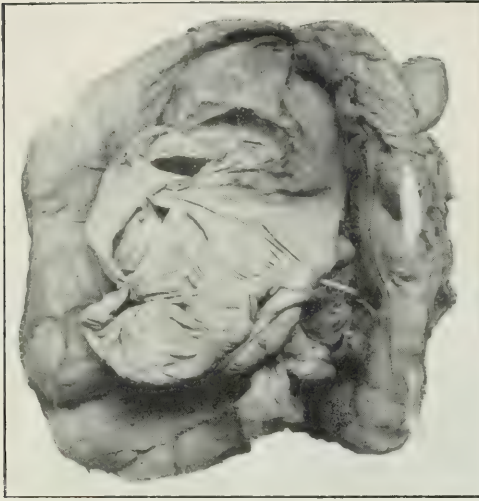
The gradual increase of the hernia will be affected (1) by the degree of laxity of the retroperitoneal tissue; (2) by the extensibility of the peritoneum.

Frequency of the Hernia.—Mr. Moynihan has been able to collect records of no fewer than fifty-eight, perhaps fifty-nine, cases of left duodenal hernia.

RIGHT DUODENAL HERNIA. (PLATE V and FIGS. 10, 11, 12, 13.)

Point of Origin.—A right duodenal hernia, in its earlier stages, occupies the right half of the abdominal cavity; as it becomes larger, it pushes its way over to the left side, and finally occupies equally the two halves of the body. Mr. Moynihan is not as decided as to the fossa in which this variety originates as he was in the case of the left duodenal hernia. Having had the opportunity of examining closely two cases of right duodenal hernia, Mr. Moynihan is of opinion that the exact situation of the commencing sac in these herniæ corresponds to the fossa of Waldeyer (*vide supra*, Fig. 7, p. 129). This fossa lies within the con-

PLATE V.

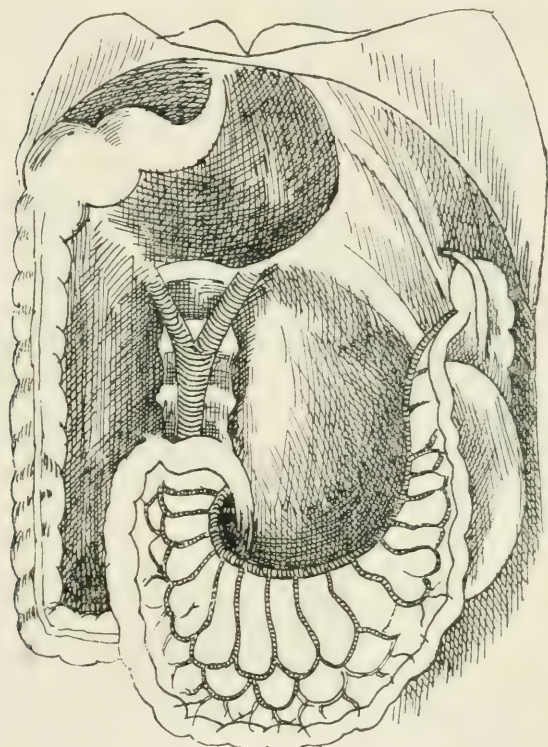


Right duodenal hernia. (St. Mary's Hospital Museum.) Mr. Jackson Clark gives the following description : " A man of middle age was admitted with symptoms of acute intestinal obstruction. He said he had been seized with sudden pain, which caused him to fall down in the street. Mr. Page performed abdominal section. This revealed a large, smooth, rounded swelling like an ovarian cyst, but giving a tympanic note. After passing a hand into the abdominal cavity, Mr. Page was able to withdraw the whole of the small intestine from an aperture at the lower part of the hernia. The patient gradually sank after the operation.

The necropsy revealed a large, flaccid cyst consisting of a double layer of peritoneum. Into this the whole of the small intestine could easily be replaced. About a foot of the upper ileum was deeply congested, the rest of the small intestine had a normal appearance. By raising the lower portion of the hernia to the right, the neck of the sac could easily be seen. It readily admitted the closed hand. In front it was bounded by the superior mesenteric artery, covered by peritoneum ; behind, by the peritoneum covering the abdominal wall.

cavity of the arch formed by the superior mesenteric artery, its orifice looking to the left, its fundus to the right and downward. Behind it are the lumbar vertebræ covered by peritoneum. Any intestine entering this pouch would develop a hernia fulfilling all the requirements of a right duodenal hernia. As it enlarges

FIG. 10.

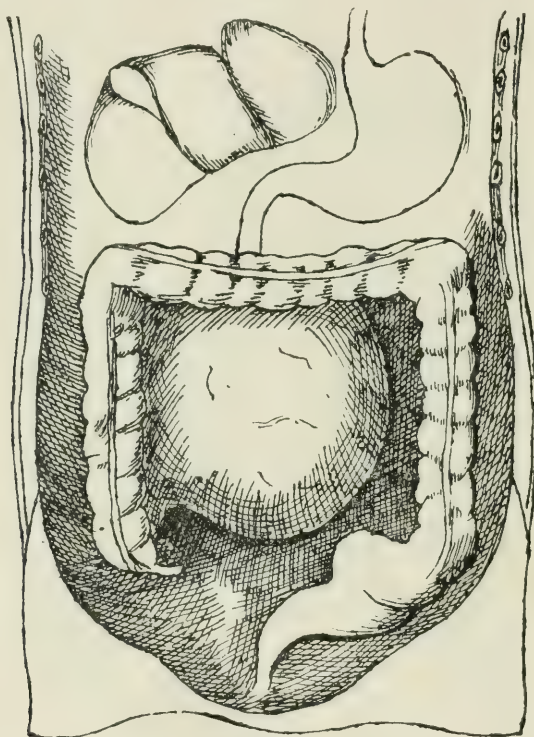


Right duodenal hernia, showing the orifice of the sac bounded by the superior mesenteric and ileocolic arteries. (Gerard-Marchant.)

towards the right, and up or down, this form of hernia would behave in a manner precisely identical with the left. The posterior parietal peritoneum would be stripped up until the colon was reached. Then either the colon would be pushed away from the tumor until the latter lay surrounded by the arch of the colon, as

in Gerard-Marchant's case (Figs. 10, 11); or if an ascending mesocolon were found, this would be spread over the anterior surface of the sac, and the hernia passing behind the colon would appear on its outer side, as occurred in a case of Brösike.

FIG. 11.

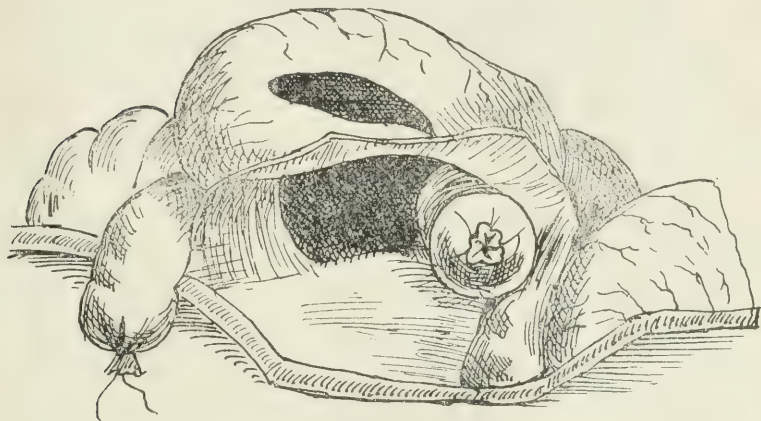


Right duodenal hernia. The sac is surrounded by the colon.

Fig. 12 was taken from one of the two cases of right duodenal hernia which Mr. Moynihan has had the opportunity of closely examining. It was taken from a case under the care of the late Dr. M. McGill. Dr. Barrs performed the necropsy and reported the case (*Lancet*, 1891). The whole of the small intestine was contained in the sac. In the anterior margin of the sac ran the superior mesenteric artery. In Fig. 12 the transverse

portion of the duodenum is shown tied and cut across. This part of the intestine then was fixed in the posterior and upper part of the sac. The fossa of Waldeyer lies nominally below the duodenum, but evidently here the fossa had been enlarged by the rolling away of the peritoneum up to the superior mesenteric artery. This vessel, emerging from beneath the pancreas, crosses the duodenum, and, in the increase of the fossa in this direction, the duodenum becomes more and more uncovered, until the whole

FIG. 12.



Right duodenal hernia (Barrs). Orifice of the sac formed by the fossa of Waldeyer.

of the anterior wall of the orifice of the sac is bounded immediately by the artery quite up to the point of its emergence.

Frequency of the Hernia.—Mr. Moynihan has collected fourteen authentic cases of right duodenal hernia. These fourteen added to the fifty-eight of left duodenal hernia make seventy-two cases of duodenal hernia altogether; a fact which emphasizes the importance of this hitherto neglected subject and the value of Mr. Moynihan's labors by which so much light has been thrown upon it.

Diagnosis of Duodenal Hernia.—It is found at all periods of life. The youngest case is one of Brösike's, the child being fourteen days old. Treitz records one in a girl aged two months. The

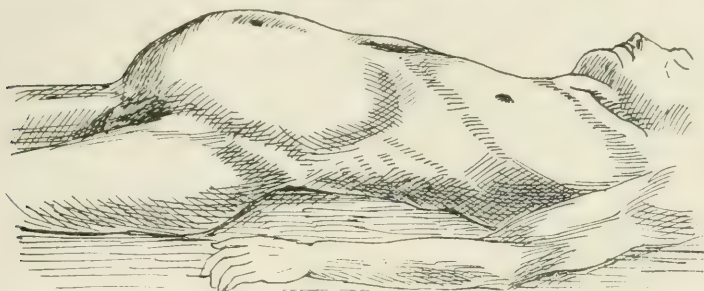
majority of cases recorded have occurred in patients who have died of internal strangulation. From an examination of the bodies in these cases, such a profound deviation from the normal as exists must have been the work of years. The hernia is chronic; the strangulation alone is acute. In some of the smaller cases—found in children—the hernia has been discovered by accident. Mr. Shattock's very beautiful specimen (Plate I) is an example of this kind. Had the child lived, this hernia would probably have gone on increasing until a sac filling the abdomen had been formed; then fatal strangulation might have supervened. It is an important question to consider whether there are any physical signs by which we are able to predict, with a fair degree of accuracy, the evidence, during life, of these forms of herniæ. Mr. Moynihan tells us that the possibility of such a successful diagnosis was first suggested by Leichtenstern in his admirable article in "Ziemssen's Encyclopædia," in the following words: "Under favorable circumstances, if the hernia is of notable size, I consider it possible to make a probable diagnosis, not a positive one, but, still, one that is based upon reasons. The circumscribed globular distention of the mesogastrium, with retraction of the region corresponding to the colon; the firm, elastic spherical lump which can be distinctly felt when the abdominal wall is thin, giving the impression of a large, somewhat movable cyst, and extending from the mesogastrium to the left; the peculiarity that this well-defined tumor always yields a sonorous note on percussion, and clear intestinal sounds on auscultation; also the loss of blood from the rectum and the presence of hæmorrhoids in consequence of the pressure on the inferior mesenteric vein—permit, when taken in connection with the subjective troubles indicating chronic disease of the abdominal organs, a probable diagnosis to be made."

In Dr. Barrs' case (*loc supra cit.*, Fig. 13) the swelling chiefly or entirely involved the lower two-thirds of the abdomen, so leaving the epigastric region depressed and empty.

Mr. Moynihan considers that the tumor, which exists in cases of duodenal hernia, will have the following attributes:

(1) It is limited to a definite region of the abdomen. In left duodenal hernia it lies, at first, to the left and upper, in right duodenal to the right and lower, part of the abdomen, but in each

FIG. 13.



Appearance of the abdomen in Dr. Barrs' case, showing median distention, and flatness in the epigastric and colic regions.

case spreads finally over almost the whole abdominal cavity. Around the swelling is an area of depression corresponding to the colon. In size the tumor may vary. It has been described as equal to the "size of a child's head." In Barrs' case it was as large as "a nine-months' pregnancy." It is slightly movable, but fixed during respiration.

(2) The tumor is marked out distinctly by palpation; on percussion it is always resonant. The striking feature is that the tumor is a palpable, definite, resonant mass. In the centre of the tumor, or all over its surface, may be noticed coils of intestine. The tumor may bear a very obvious relation to the clinical condition of the patient, becoming more tense and prominent, and very much more tender when the symptoms undergo exacerbation. As the symptoms decline in severity, the tumor becomes less aggressive.

(3) On auscultation, distinct gurgling sounds may be heard anywhere in the tumor.

(4) It is an important aid to diagnosis to remember that, owing to the position of the inferior mesenteric vein in the margin

of the orifice of a left duodenal hernia, the radicles of this vein may become enlarged, as in the case of the hæmorrhoidal veins, or venous trunks in the anterior abdominal walls may be so increased in size as to form striking features of the case.

The symptoms may have been so slight that little or no attention was paid to them, or they may have been so sudden as to swiftly strike the patient down when apparently in good health. It is not without some importance to note that in the most carefully recorded cases a history of chronic slight digestive or intestinal troubles could be obtained. In the recording of future cases, this thorough investigation of the earliest history should be especially attended to.

Treatment.—If acute obstruction exists, whatever the diagnosis may be supposed to be, the abdomen will be promptly opened. If a duodenal hernia were found, it would be reduced. The orifice of the sac should be dilated, not incised, if it can be possibly avoided. If division be needful, the probable proximity of a large vessel, *e.g.*, the inferior mesenteric vein or the left colic artery, must be remembered. If one of these has to be divided, two ligatures must be first applied; but the effect of ligature and division of the above vessels on the intestine which they supply must always be a very grave matter.

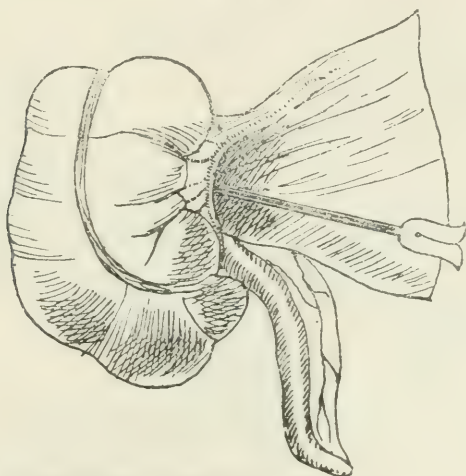
Two cases only have proved successful after operation, that of Neumann's, one of right duodenal hernia (*Deutsche Zeitschrift für Chirurgie*, 1898, Band xlvii, p. 476), and Mr. Tubby's, a case of presumably left duodenal hernia (*British Medical Journal*, Vol. ii, 1898).

THE PERITONEAL FOLDS AND FOSSÆ IN THE NEIGHBORHOOD OF THE CÆCUM AND VERMIFORM APPENDIX.

While Mr. Moynihan deals with these subjects in his usual complete and detailed method, there is not the same need to pay the same attention to this subject as in that of duodenal herniæ.

Pericæcal herniæ are extremely rare. Mr. Moynihan has only collected sixteen cases; of these he rejects nine; of the remaining seven several are very incompletely reported. Again, while Mr. Moynihan is the first to give us an authoritative account of the duodenal fossæ and herniæ in our own tongue, English-speaking surgeons have been rendered familiar with the fossæ about the cæcum and appendix by many writers, American as well as English. For these reasons, the very rare herniæ which are met with in this region and the fossæ in which they occur may be considered together very briefly.

FIG. 14.



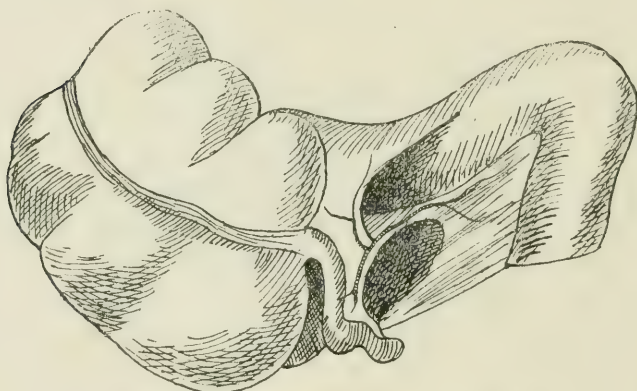
■ The anterior vascular (ileocolic) fold and fossa.

Mr. Moynihan, in his careful and elaborate study, shows that six fossæ may be met with in this region; of these fossæ only three have been found to contain herniæ, and these extremely rarely.

1. *Anterior Vascular Fossa* (Fig. 14).—(Ileocolic Fossæ of Lockwood and Rolleston. Superior Ileocæcal Fossa of Treves.) Mr. Moynihan prefers the first to the better known names, as this fossa has for its anterior boundary the anterior vascular or ileocolic fold (Fig. 14), a fold which passes from the front of the

mesentery over the anterior aspect of the colon and then on to the front of the cæcum to an extent which varies with age, being more extensive in earlier life. Because this fold is very constant, and because it is raised up by that one of the two anterior branches of the ileocolic artery which, continuing the line of the main trunk, runs over the front of the ileocolic junction, Mr. Moynihan prefers the name "anterior vascular" to "ileocolic" for this fold. The fossa of the same name lies behind this fold in front, and the mesentery, ileum, and a small portion of the cæcum behind. It is a narrow fossa, which is stated by Mr. Moynihan to diminish

FIG. 15.



The meso-appendix and the ileo-appendicular fold and fossa.

in size as life advances. He has found no case of hernia into it recorded.

2. *Ileo-Appendicular Fossa* (Ileocæcal Fossa of Lockwood; Inferior Ileocæcal Fossa of Treves, Fig. 15). This fossa lies behind the ileo-appendicular fold and the meso-appendix. The ileo-appendicular or ileocæcal fold extends from the lower border of the ileum—that directly opposite the line of the mesenteric attachment—to the anterior surface of the meso-appendix. The size of this fossa differs very largely, being dependent chiefly on the size of the ileo-appendicular fold.

Herniæ.—Mr. Moynihan has collected four cases of hernia into the ileo-appendicular fossa, one only of which is well authenticated. It is recorded by Dr. T. E. Little (*Dublin Journal of Medical Science*, Vol. iii, 1871, p. 237, Fig. 16). The patient, aged sixty, had enjoyed excellent health up to the attack, nine days after the first evidence of which he died, from symptoms which may, in brief, be described as those of unrelieved strangulated

FIG. 16.



Ileo-appendicular hernia. (Little's case.)

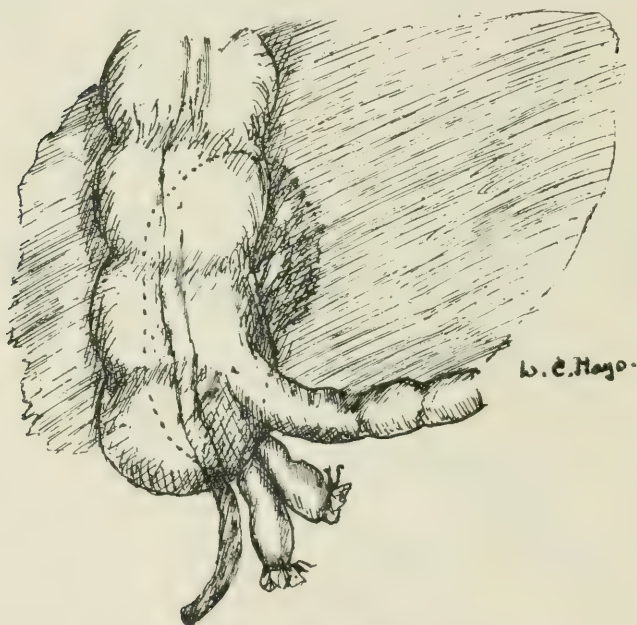
hernia. A large loop of the ileum, sixteen or eighteen inches long, was strangulated and gangrenous.

Fossa Ileocæcalis Intima (Fossa of Hartmann). In some cases the lower attachment of the mesentery to the iliac fossa is prolonged into a sharp fold springing from the ileocolic angle, and back and inner part of the cæcum, and running backward to the iliac fossa. Between it and the meso-appendix the fossa of

Hartmann may exist. Mr. Moynihan strongly doubts its frequency. He follows Leichtenstein in considering that one case of hernia has occurred here. It is recorded by Dr. Snow (*London Medical Gazette*, 1846). The patient, aged twenty-four, died, with the symptoms of intestinal strangulation, on the fourth day of the attack. A knuckle of the ileum was found strangulated.

The Retrocolic or Retrocæcal Fossa (Subcæcal Fossa of Lockwood, Fig. 17). In order to see this, it is needful to turn the

FIG. 17.



Hernia into the retrocolic fossa. (Aschoff.)

cæcum upward. There will then be exposed a fossa of varying size behind the cæcum and ascending colon, between the layers of the ascending colon.

Mr. Moynihan has collected eleven cases which have been recorded as instances of retrocolic hernia. Of these, he states that only two can be accepted with any show of probability, and, as

a result, concludes that this form of hernia is very rare—rarer, in fact, than ileo-appendicular hernia.

In the short time that has elapsed since, another case has been recorded. It is by Aschoff (*Berliner Klinik*, October 1896), and it was illustrated in Fig. 17. The patient was a female aged forty-eight. She was suddenly seized with an acute attack of abdominal pain in the right lower abdomen. Constipation followed, but enemata on two occasions brought away a little fæcal matter. On the twenty-first day an operation was performed by Körte. The small intestine was found immensely distended; the ascending colon, cæcum, and the termination of the ileum were collapsed. A coil of intestine was found in a pouch behind the cæcum and ascending colon. The ascending colon had an unusually long mesentery. The strangled gut was withdrawn, and the patient made a good recovery.

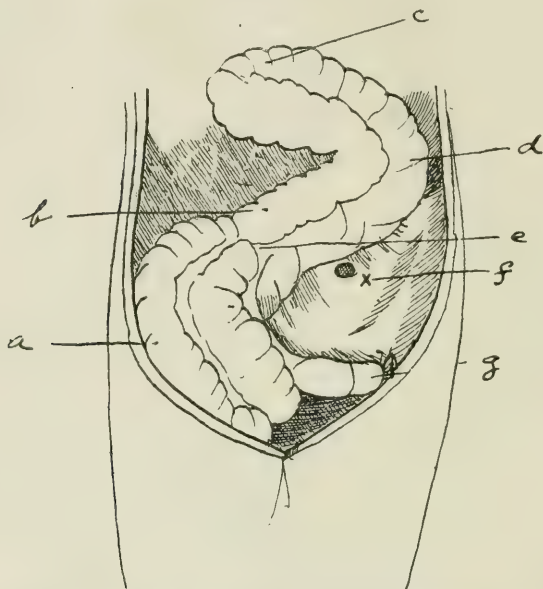
THE INTERSIGMOID FOSSA AND HERNIA. (FIG. 18.)

Owing to the great rarity of hernia here,—Mr. Moynihan considers only two cases to be authentic,—the anatomy of the fossa and the hernia may be considered together and briefly.

The Intersigmoid Fossa (Fig. 18). Mr. Moynihan estimates the frequency of this fossa at a little over 70 per cent. Its frequency becomes less with increasing years, owing, as Treitz pointed out, to the processes of thickening and adhesion which are often present in the mesosigmoid of the aged and which tend to obliterate the fossa. Its orifice is found by drawing the sigmoid loop upward and to the left, and thus exposing the under surface of the mesosigmoid. On this surface can be seen the entrance to the fossa situated in the line of attachment of the mesosigmoid at a point near the inner border of the psoas magnus. It lies over the common iliac artery in front of its bifurcation. The fossa lies between the mesosigmoid and the posterior parietal peritoneum. The sigmoid artery lies above it and to the right (Treves). The only two cases considered by Mr. Moynihan as being authentic are those published by Mr. Eve (*British Medical Journal*, June

13, 1885) and Mr. W. W. Adam Eccles (St. Bartholomew's Hospital Reports, Vol. xxxi, p. 177). In each case a loop of small intestine was the part strangled.

FIG. 18.



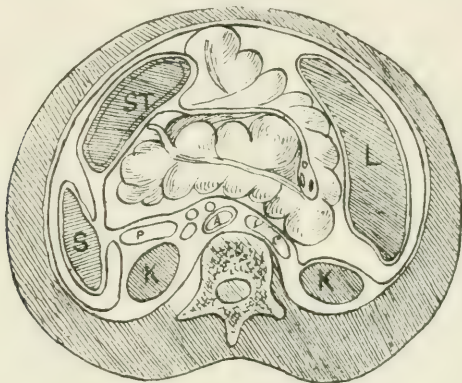
Mr. Eve's case of intersigmoid hernia.—*a*, Cæcum; *b*, *c*, ascending colon; *d*, transverse colon; *e*, band of fibrous tissue; *f*, intersigmoid fossa; *g*, end of sigmoid flexure.

HERNIA INTO THE FORAMEN OF WINSLOW. (FIG. 19.)

This hernia is extremely rare. This is explained by the fact, long ago pointed out by Engel, that the transverse colon forms an insuperable barrier to the passage of the small intestine towards the foramen. Mr. Moynihan adds that the foramen is very probably potential rather than actual; the anterior and posterior boundaries being usually in contact. Mr. Moynihan finds eight cases recorded. In six of these it was the small intestine, in two the large, which was involved. To account for this, Mr. Moynihan gives, as explaining conditions, (1) a common mesentery for the whole intestine; (2) abnormal length of the mesentery, and, consequently, undue mobility of the intestine; (3) abnormally

large size of the foramen. The best recorded cases are those by Dr. E. Square, of Plymouth (*British Medical Journal*, Vol. i, 1886, p. 1163), and Sir F. Treves (*Lancet*, October 13, 1888, Fig. 19). In the first case the patient died after an obstruction of between three and four days; the ileum was the part involved. It was thought that an early operation would have been successful. At the necropsy the bowel was withdrawn with some difficulty. In the case of Sir F. Treves, two or three feet of small intestine,

FIG. 19.



Section (diagrammatic) of the abdomen at the level of the foramen of Winslow, showing the hernia *in situ*. (Treves.)

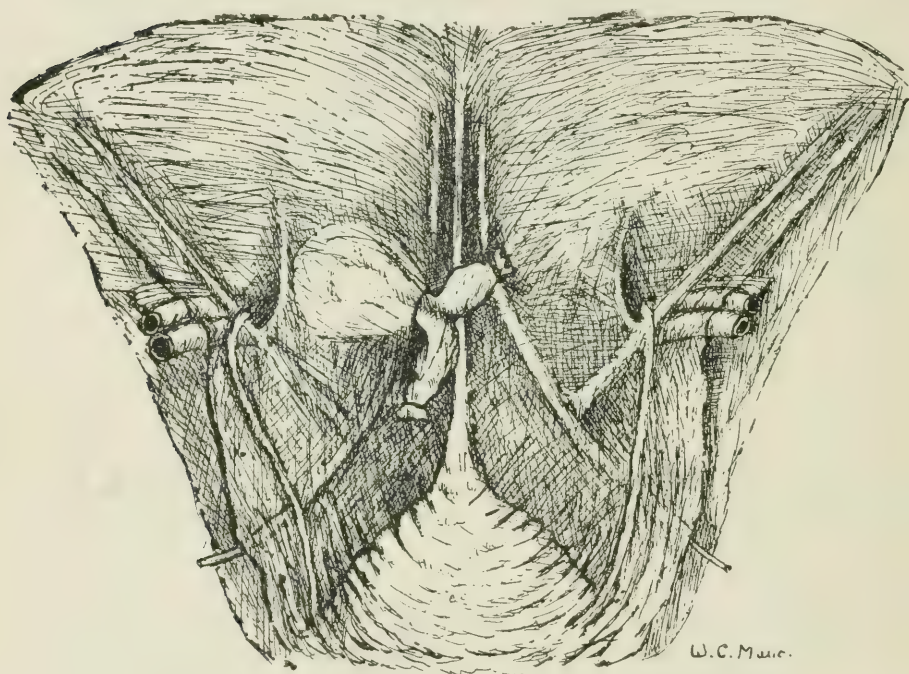
the cæcum ascending and great part of the transverse colon, were involved. The small intestine alone could be withdrawn. At the necropsy, reduction of the rest could not be accomplished until the hepatic artery, the portal vein, and the bile-duct had been divided.

Diagnosis.—Mr. Moynihan thinks that in a typical case we may expect to find acute intestinal obstruction, with intense, almost intolerable, epigastric pain, and epigastric prominence. He further states that it is interesting to note that there are no recorded symptoms of pressure in the hepatic artery, portal vein, or bile-duct.

Treatment.—Mr. Moynihan is of opinion that where, as is probable, reduction is found impracticable, the formation of an artificial anus is the only possible treatment.

Hernia along the Line of the Obliterated Hypogastric Artery.
 —Aschoff (*Berliner Klinik*, October, 1896) records the case of a man, aged sixty-one, who for eleven years had noticed a left inguinal hernia which had been readily controlled by a truss. Suddenly, after the reduction of the hernia, an acute seizure of abdominal pain was experienced. Symptoms of intestinal obstruction

FIG. 20.



Hernia along the line of the obliterated hypogastric artery. (Aschoff.)

tion were observed. The diagnosis rested between reduction in mass and internal strangulation near the internal abdominal ring. At the operation (Körte) a strangled loop of gut was found lying in a pouch to the outer side of the obliterated hypogastric artery. The internal abdominal ring and its surroundings were quite normal. The orifice of the pouch was closed by suture after the withdrawal of the gut. A good recovery followed.

INDEX TO SURGICAL PROGRESS.

GENERAL SURGERY.

I. Scopolamine, Morphine, Narcosis. By DR. E. BLOS (Carlsruhe). Scopolamine belongs in the atropine, tropene group, being isomeric with atropine, hyoscine, hyoscyamine, and atropine. The greatest drawback to its use is the inconstancy in the purity of the product, as it is apt to contain isomers.

Atropine, hyoscyamine, and scopolamine in small doses increase in direct proportion in their hypnotic properties. Oculists have found that whereas atropine instilled into the eye may cause symptoms of restlessness, scopolamine has a sedative effect. Kobert found that scopolamine applied to the cortex of the brain greatly diminished its electric irritability. The use of scopolamine in the human body bears this out, for in certain psychiatric clinics it has become indispensable, and it was here that Schneiderlin, the originator of this form of narcosis, first applied this drug as a narcotic in operations.

Outside of its effect on the cerebrum, it is in its accessory action that its great value rests, by permitting the conjoint administration of another sedative, morphine, which enhances its hypnotic properties, and at the same time permitting the administration of larger doses of scopolamine to the point of complete narcosis.

The peculiar combined administration of scopolamine and morphine consists in their cumulative hypnotic action on the cerebral centres, whereas on the cord and peripheral ganglia their action is antagonistic.

Action of scopolamine on the heart is harmless, the pulse-rate is increased, and the pressure of the blood is raised.

Oculists have testified that whereas scopolamine has replaced

atropine, the unpleasant symptoms of the latter have no longer to be fought with morphine. Scopalamine is a vasodilator. Respiration is accelerated and deepened. It is thus apparent that morphine produces diametrically the opposite effect.

Cyanosis, if it occurs, points to the preponderance of the morphine. Scopalamine tends more to paralyze the motor nerves, morphine to those of sensation. Bearing on the very important feature of muscle relaxation, paralysis is hardly the proper term, since some muscle tonus persist, and this deficiency limits the adoption of scopalamine and morphine.

The antagonism of scopalamine and morphine in combination is complete, whereas the hypnotic action becomes cumulative. The narcosis attainable obviates tissue changes incident to the use of chloroform and ether. (Nephritis, ether pneumonia, chloroform jaundice.) Shock is prevented, for, since scopalamine is far more rapidly eliminated, morphine outlasts it, and the beneficent action of morphine comes into play to avert shock. The blood-pressure being raised, hæmostasis must be more exacting. Recovery from the anæsthetic being far more rapid than after inhalation narcoses, the ingestion of food can soon begin without the likelihood of nausea and vomiting.

This method of narcosis was applied in 105 instances, 57 females, 48 males, between the ages of fifteen and seventy-three, to operations of all possible magnitude. The combination which proved most effective was five decimilligrammes scopalamine ($\frac{1}{120}$ grain) and three milligrammes morphine (one-half grain). Under these circumstances the pulse was accelerated and respiration diminished, wherefore a diminution of morphine was found necessary to two milligrammes (one-third grain).

The criterion of a good narcosis is dependent on the dilated pupil due to a predominating effect of scopalamine, and where this was absent, narcosis was more or less imperfect. The pupillary (mydriasis) reaction is therefore the index for a successive injection of scopalamine. With dilatation of the pupils, corneal

reflex becomes diminished and somnolence sets in; narcosis is profound within three-fourths to one and one-half hours, and lasts about one and one-half hours, about which time more scopalamine and morphine may have to be injected.

To ascertain the tolerance of scopalamine and morphine, on the evening before the operation, one-half the maximum dose is given, and out of 105 administrations, six times this was ill borne, and scopalamine and morphine were therefore not injected.

The worst to be said of scopalamine is its inconstancy, yet toxic lethal symptoms are unheard of. One death is reported after operation for resection of the os pubis, tuber ischii, and sacrum for tuberculosis in a tuberculous patient. Small dose was well borne (five scopalamine and three morphine). Dose for narcosis, ten decigrammes scopalamine and five milligrammes morphine, this repeated in three-fourths of an hour to one-half, later narcosis set in. Six hours after operation respiratory paralysis caused death.

Post-mortem. Amyloid viscera, bilateral pulmonary tuberculosis. Author attributes improperly acting kidneys as responsible for the slow elimination of scopalamine. Where narcosis is slow to appear or uncertain, it may be ushered in more speedily by a few inhalations of ether. In the presence of myocarditis, the dose should not exceed ten decigrammes scopalamine and six milligrammes morphine. The scopalamine to be kept dry and freshly prepared.—*Beiträge zur klinischen Chirurgie*, Band xxxv, Heft 3.

ABDOMEN.

I. A New Operation for Congenital Hernia of Infants. By DR. WILLY ANSHUTZ (Breslau). The treatment of the sac in congenital hernia is always a matter of great concern, since the laceration of the cellular tissues in isolating the cord structures offsets the conditions favoring perfect healing of the wound, renders the cord liable to injury, and finally requires a separate drainage of the serous investment of the testicle. To obviate all of

these disadvantages, the author has of late applied the principle of the Jaboulay Winkelman method employed for operation of hydrocele, consisting in an eversion of the sac.

The neck of the hernial sac is isolated. An incision of the smallest possible size is made into the sac that will permit of the reduction of its contents. The neck of the sac is closed by a purse-string suture passing through the peritoneal layer only. The central part of the hernial sac is thus disposed of. Through the slit in the sac the testicle is dragged out, thus everting its investments, and thereby obviating any dissection of the sac. The anchoring of the testicle in its new bed is effected by suture of the sac just below the purse-string suture. The sutures to be of silk, to avoid early absorption and unfolding of the sac, and the opening to be very small, to prevent the testicle from slipping back. The use of silk and a small opening are safeguards against recurrences peculiar to this new hydrocele operation. All authorities recognize the difficulty in treating these hernial sacs, and concede them to be responsible for subsequent recurrences.

Twenty-one cases have thus far been operated. In twelve instances sufficient time, two and one-half years, has elapsed to rule out the likelihood of a relapse.—*Beiträge zur klinischen Chirurgie*, Band xxxv, Heft 2.

GENITO-URINARY ORGANS.

I. Tuberculosis of the Male Genital Organs. By PROFESSOR DR. VON BÜNGNER. In this dissertation von Büngner brings forth additional evidence to justify his plan of high castration and evulsion of the vas deferens as the best operation for the cure of tubercular testis involving the vas deferens. Experiments conducted on the cadaver showed that it was possible to evulse four-fifths of the vas deferens. Serial sections showed the vas deferens lacerated at a healthy level, and the subsequent clinical observation demonstrated these cases to be free from recurrence. After a lapse of five and three-fourths years, of

eleven cases thus treated eight were free from recurrence, one died of miliary tuberculosis, and two were treated with iodoform glycerin injections. The necessity of (von Büngner's) high castration will impress itself upon those who admit that tuberculosis of the vas deferens is in most instances an ascending process secondary to tuberculosis of the epididymis. Whereas the earlier observers regarded tuberculosis of epididymis a resultant of descending tuberculosis, the weight of evidence of foremost pathologists, Virchow, Rokitsky, Weigert, aver that vas deferens tuberculosis is secondary to tuberculosis of the epididymis. The earlier wrong belief had its origin in post-mortems conducted on advanced cases who succumbed to their tuberculosis, the incipient cases were not studied. Von Bruns, from a study of 111 cases operated on, has no doubt thought that in the great majority of instances epididymis tuberculosis preceded disease of the vas deferens.

Von Baumgarten, furthermore, was not able to produce tuberculosis of the vas deferens when cultures of tubercle bacilli were injected into the prostatic urethra or prostate, but if injected into the testicle, tuberculosis of the vas deferens regularly followed, whence Baumgarten concludes that tubercle bacilli do not travel against the stream of the blood or lymph secretion. The author himself found tuberculosis limited in six instances to the vas deferens adjoining the epididymis, and this also was corroborated by microscopical serial sections which showed the intensity of tuberculosis diminishing as sections progressed towards the prostate. Finally, the fact that diffuse tuberculosis of the vas deferens is more common than the disseminated is also favorable to the teaching of ascending tuberculosis; and where disseminated tuberculosis existed, those nodes nearer the prostate were not in as advanced a state of degeneration, and clinically, too, there is an appreciable diminution in the size of the fusiform nodules from the testes to the prostate.

In twenty instances, five times tuberculosis of the epididymis

alone existed; four times the entire tract was affected, in six cases the testis was also diseased, and in fourteen instances the testis epididymis and vas were the seat of disease. Von Büngner does not deny the occasional occurrence of descending tuberculosis.

Acceptance of this overwhelming proof as to the mode of dissemination of tuberculosis of the vas deferens is responsible for the vogue of very high castration and evulsion. For diffuse involvement of the entire genital tract, intercanalicular injections of iodoform glycerin emulsion into the vas deferens is advised, alone or in conjunction with high castration. On the other hand, extirpation of the entire genital tract is in place. The use of intercanalicular injections are too recent to permit of conclusions.

As to castration, 75 per cent. are cured after the lapse of three years. The prevailing opinion that psychoses are incident to bilateral castration is not warranted in the light of present observations.

To still further enhance the per cent. of cures, early recognition of the disease is to be sought by a rectal examination of the prostate.—*Beiträge zur klinischen Chirurgie*, Band xxxv, Heft 1.

EXTREMITIES.

I. Congenital Dislocation of the Patella. By DR. BLENCCKE (Magdeburg). The author has subjected the literature bearing on this deformity to a review and found some fifty cases credited as upward dislocation of the patella of congenital origin.

The patella being a sesamoid bone cannot undergo any upward displacement unless associated with relaxation or rupture of the ligamentum patellæ. Therefore the author would, *strictu sensu*, speak of elevation (Hochstand) of the patella under these circumstances, and limit the appellation dislocation to lateral displacements.

A study of many of the reported cases showed that disturbances attributed to this displaced patella were not tenable, since

in many other like instances no such functional disturbances were at all encountered. A study of the histories shows that in many of these instances the elevation of the patella was due to contracture of the quadriceps extensor and other muscles of the thigh as an expression of (Little's disease) spastic infantile paralysis. Outward dislocation of the patella is due to deficient development of the external condyle. There is appended a radiograph showing the elevation of the patella as an accidental find in a patient in no wise disturbed in his gait.—*Zeitschrift für Orthopædische Chirurgie*, Band x, Heft 3.

MARTIN W. WARE (New York).

REVIEWS OF BOOKS.

ATLAS AND EPITOME OF OPERATIVE SURGERY. By DR. OTTO ZUCKERKANDL, Privat-docent in the University of Vienna. Second edition. Edited by J. CHALMERS DA COSTA, M.D. Philadelphia: W. B. Saunders & Co., 1902.

To the words of commendation which we applied to the first edition of this work may be added the statement that the second edition merits all of these, and, moreover, augments its value by the addition of much new and useful material. A number of the chapters have been practically rewritten; the new operations of surgery have been introduced; and the illustrations have been increased by the addition of some sixteen colored plates and sixty-one figures in the text.

The general character of the work has not been changed. It is essentially an atlas and an epitome of the operations of surgery. The author has laid down the rules and methods of surgical procedure with the clearness that springs from definite knowledge and the emphasis that is born of conviction. He has described the steps of the usual and important operations. The verbal descriptions, though lucidly given, are still further illuminated by a large number of excellent pictures. The colored plates are of much artistic merit. Were we to criticise them, we should say that they are almost too clear. They make the structures to appear more distinctly than either the surgeon or the anatomist sees them. The vessels exposed in pictures of dissections show the former to be distended beyond their normal size, probably because of the full injection of the vessels from which the pictures were drawn. And if redness is the badge of arteries, blueness that of veins, whiteness that of nerves, then there is no confusing of these structures. The pictures illustrating intestinal

suture would lead the student to use needles and thread of too great size. In our review of the first edition we called attention to the unnecessarily large trocar and cannula pictured in suprapubic puncture of the bladder. This same heavy instrument is made to do duty in this edition.

The text begins with the description of the means employed by surgery in the division of tissues in the dissections, exposures, and removals of structures. Naturally, this is followed by the reunion of tissues, in which is treated the suturing of wounds, muscles, tendons, nerves, and bones,—all of the structures except blood-vessels. Then is taken up operations on the extremities,—ligation of vessels, amputations, exarticulations, and resections. Under the heading of operations on the head and neck are trephining, operations on the jaws and tongue, the plastic operations of the mouth and face, operations on the nerves of the head, the air passages, and vessels of the neck.

The description of the operations upon the trunk includes practically all the accepted procedures upon the thorax, abdomen, and pelvis. The author gives Kocher's method of amputation of the breast, but unfortunately does not describe the better operations practised generally by American surgeons. The operations upon the thoracic viscera are well described.

Then in succession are treated operations upon the intestine, stomach, rectum and anus, biliary apparatus, and the genito-urinary organs.

All of the descriptions are clear and terse. The translation has been well done. The book is a safe and excellent guide for the student and practitioner who wishes to refresh himself in any particular operation.

Inasmuch as most surgical operations are peculiar and not according to rules, this is in no sense a text-book on operative surgery: it simply deals with the usual steps in the more common operations.

JAMES P. WARBASSE.

A TEXT-BOOK OF SURGICAL PRINCIPLES AND DISEASES OF THE FACE, MOUTH, AND JAWS. For Dental Students. By H. HORACE GRANT, A.M., M.D. Philadelphia and London: W. B. Saunders & Co., 1902.

This little work is not designed as an exhaustive treatise on surgical affections of the mouth, face, and jaws, but is simply intended to make the student of dentistry familiar in a general way with those conditions with which from time to time he may be confronted for purposes of diagnosis. Many facts are clearly and concisely stated. The several varieties of inflammation, ulceration, and tumor formation are in turn considered, and there are good chapters on tuberculosis, syphilis, and malignant disease of the face and cavity of the mouth. Perhaps more space might have been given with advantage to such conditions as fracture and necrosis of the lower jaw. The book is well illustrated, the text is clear, and on the whole it serves well for the purpose for which it is intended.

WALTER A. SHERWOOD.

ATLAS AND EPITOME OF TRAUMATIC FRACTURES AND DISLOCATIONS. By PROFESSOR DR. H. HELFERICH. Edited with additions by JOSEPH C. BLOODGOOD, M.D. Philadelphia: W. B. Saunders & Co., 1902.

This book has gone through five editions in the original, at least two in French, and now Saunders gives it to us in English very well done by Bloodgood, who has added editorial notes in the text.

The chapter on general consideration of fractures covers the ground completely, but with commendable brevity.

Beginning with the skull, fractures and dislocations are considered as they occur in each region. The more common injuries are described at length, while the rare ones are described briefly. The colored illustrations are very good. Accompanying each illustration is a full description, emphasizing the points which

the author wishes to make, and greatly enhancing the value of the plate. The plates are prepared in many instances from injuries artificially produced on the cadaver. The simplicity and directness in the illustrations and text will be of the greatest assistance to the student.

Perhaps nothing in the book is better done than the descriptions and illustrations of the subcoracoid dislocation of the humerus. Each point of diagnosis is well illustrated. The four plates in illustration of Kocher's method of reduction convey to the mind at once the technique of the operation and the reason for it. We have used the plates in this volume for teaching students with the greatest satisfaction.

It is a pleasure to have a good surgical work in size convenient to handle.

WILLIAM B. BRINSMADE.

THE TREATMENT OF FRACTURES. By CHARLES LOCKE SCUDDER, M.D. Third edition. Philadelphia: W. B. Saunders & Co., 1902.

We are pleased to see Scudder's treatment of fractures so popular as to require three editions in three years.

This book has been reviewed in detail in its earlier edition. It has met with commendation on all sides. The chapter on fractures of the bones of the face again appeals to us. It covers the ground more fully than any work with which we are familiar. The treatment of fractures of the lower jaw by the use of the severed moulded splint is particularly good.

Several new plates of fractures of the spine, cut in sagittal section, give an excellent idea of the complicating deformity and injury to the cord.

The pages on Colles's fracture and fracture of the hip are unchanged, because they need no change. We cannot too strongly recommend for study the chapter on anatomical facts regarding the epiphyses to every practitioner who attempts to treat fractures in children.

The chapter on gunshot fractures of bone is taken from the experiences of those military surgeons who have had opportunity for the treatment of these injuries. The conclusion is that, with the modern bullet and smokeless powder, the principles underlying the treatment of closed fractures are to be followed in the case of gunshot fractures.

Dr. Codman's chapter on the Röntgen ray and its relation to fractures bring us up to date on this subject.

The additional illustrations of the employment of plaster of Paris add to the value of that chapter.

WILLIAM B. BRINSMADE.

WORK BOOK IN SURGERY. By LUZERNE COVILLE. Ithaca, New York, 1902.

Dr. Coville, in his capacity as lecturer on surgery in Cornell University, has learned to appreciate the needs of the medical student, and the little book which he presents has been inspired by his knowledge of their wants.

The work is a surgical primer, giving a sufficient amount of detail so that the student may grasp the general principles of the subject. The chapters come under the heading of surgical pathology, inflammations, surgical diseases, injuries and diseases of soft parts, injuries and diseases of bone, diseases and injuries of joints, tumors, surgical operations, and surgical dressings.

We commend particularly to the practitioner as well as the student the author's excellent chapter on surgical diagnosis. The principles and precepts here laid down represent the best that the teacher can offer. The closing sentence is here reproduced: "Work for good results always. Make the diagnosis what it is, even at the expense of the patient's wishes or preclusions or his presumptions. And in expressing the diagnosis to him or to his family, and through it the prognosis of his condition, the surgeon should be candid and direct, and yet kind." We commend this to the student.

JAMES P. WARBASSE.

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ORIGINAL MEMOIRS.

AN OPERATION FOR THE RADICAL CURE OF ANEURISM BASED UPON ARTERIORRHAPHY.

BY RUDOLPH MATAS, M.D.,

OF NEW ORLEANS,

Professor of Surgery in the Medical Department of the Tulane University of
Louisiana.

I.

THE radical cure of aneurism as classically described embraces two distinct procedures: (1) The old operation of Antyllus, in which the sac is left *in situ* after evacuation of the contained clot and ligation of the proximal and distal ends of the main artery outside of the sac, and (2) Purmann's operation, also attributed to Phillagrius, in which the sac is extirpated *in toto* or in its greater part. Numerous modifications of these procedures have been suggested at various times and by different operators, which affect details of technique, but do not alter the fundamental principles of these methods. In the original procedures, as well as in their subsequent modifications, from remote antiquity to the present time, the ligature has been relied upon almost exclusively as the hæmostatic agent to arrest the circulation in the sac and to control the bleeding from the artery which feeds the aneurism.

In the operation described in this paper, the sac is, as a rule, not extirpated or disturbed, except in so much as is required to evacuate its contents and freely expose its interior, and in this way it may be regarded as a derivative of the old

Antyllian operation. Apart from this it differs essentially from either of the classical procedures in the fact that no ligatures are applied to the main artery, and that the circulation in the sac is arrested, and hæmostasis is secured, solely by suturing the arterial orifices found in the interior of the sac. Again, in suitable cases—that is, in the true sacciform aneurisms with a single orifice of communication with the parent artery—this method will allow the operator to obliterate the aneurism without obstructing the lumen of the artery or interfering with the circulation in the injured or diseased vessel,—a great desideratum which should never be lost sight of when operating upon this class of cases.

Finally, it differs essentially from the Antyllian operation in the fact that the cavity of the sac is not simply packed or drained and left to heal by granulation, but is at once obliterated by inverting or infolding the walls of the sac with the attached overlying skin. The flaps thus formed are sutured to the bottom of the cavity, so that no dead spaces are left to suppurate or favor secondary complications.

The operation now proposed by the writer is applicable to all aneurisms in which there is a distinct sac, and in which the cardiac end of the main artery can be provisionally controlled. It is especially applicable to all forms of peripheral aneurisms of the larger arterial trunks (carotid, axillary, brachial, iliac, femoral, and popliteal); and, while the author has had no experience with similar lesions of the large visceral trunks, the principle suggested would appear to be applicable to abdominal aortic and other accessible forms of abdominal aneurisms. It is particularly indicated in the treatment of traumatic aneurisms in which the wounded artery communicates with a well-developed and circumscribed sac, and in all fusiform and sacculated aneurisms, whether traumatic or idiopathic, in which the conditions for securing provisional hæmostasis can be obtained. The method proposed does not contemplate the treatment of arteriovenous aneurism and the circumscribed or diffuse pulsating hæmatomas of recent origin, which result from arterial and arteriovenous injuries. These cases offer admirable oppor-

tunities for the conservative application of arteriorrhaphy, with the view of preserving the lumen of the injured vessel, and thus maintaining their functional value as blood-carriers. Notable illustrations of the value of arterial and venous suture in cases of diffuse traumatic aneurism, or, rather, pulsating hæmatoma, are the cases of simultaneous injury of the common femoral artery and vein, reported by Murphy,¹ of Chicago, in 1897, and by Cammaggio² in 1898. Murphy's case is especially notable as the first on record in which an artery was successfully united by suture after circular resection of the injured area. The reported cases of fully established arteriovenous aneurisms treated by separate suture of the openings of the arteries and veins are few, thus far; but those reported by Zoege von Manteuffel³ (1895), Gerard Marchant⁴ (1898), and Peugniez, of Amiens⁵ (1900), are examples of the growing appreciation of arterial suture in the treatment of this class of aneurismal injuries.* In these cases, as in the more frequent simple wounds of arteries, the technique adopted is that of angiorrhaphy, or the suture of comparatively normal arteries, and is subject to the rules which govern the application of this procedure. The anatomical and operative conditions, however,

* Including the above-cited cases of arteriovenous injury, the author has collected thirty cases of suture of the arteries alone in which the vessel had been sutured by either lateral or circular arteriorrhaphy in the human subject. One of the cases included in this compilation occurred in the author's practice while this paper was being revised for the press (November 7, 1902). The axillary artery was injured while extirpating an adherent lymphosarcoma from a woman aged fifty-eight years. The rent in the artery was closed with four lateral silk sutures which did not penetrate the lumen of the artery. The vessel was considerably reduced in caliber at the seat of suture, and the pulsation was faint at the wrist, but in a few minutes it improved, and finally regained its normal fulness. The circulation of the arm was unimpaired and the wound healed *per primam*; hæmostasis was perfect.

The reader interested in the bibliography of arteriorrhaphy and in the collective reports of cases will find valuable information in the following recent contributions: G. Tomaselli, *La Clinica Chirurgica*, Milano, June 30, 1902, Anno x., No. 6; Hubbard, *Boston Medical and Surgical Journal*, March 27, 1902; W. Korte, *Archiv für klinische Chirurgie*, 1902, Band lxvi, pp. 919-937; Salinari and Virdia, *Giornale del R. Esercito*, Roma, 1902, Nos. 4 and 5.

differ so radically from those met in the fully-developed aneurismal tumors, which are the subject of discussion in this paper, that it would be digressive and unnecessary to dwell upon them further on this occasion.

II.

The principles which underlie the technique of the author's operation are very simple, and are based upon a few well-established histological and pathological data which need be only briefly mentioned in order to grasp the rationale of the procedure and to adapt it to the variations that are met in practice. The dominant and essential feature of the operation is that the aneurismal sac is regarded as a large diverticulum or prolongation of the parent artery with which it is connected; that the lining membrane of the sac is a continuation or expansion of the endothelial intima which lines the interior of the artery, and in fact of the entire vascular system, and that the sac itself, when not disturbed from its vascular connections, is capable of exhibiting all the reparative and regenerative reactions which characterize the endothelial surfaces in general when subjected to irritation. In other words, the sac when fully formed and developed is the analogue of the serous cavities elsewhere, not only in a histological and embryological sense, but from a surgical point of view is to be treated as a serous cavity, comparable to the peritoneum, pleura, pericardium, dura, etc. In the orifices of communication which open into the sac and in the contiguous marginal areas, the identity of structure of the aneurismal sac and the parent artery is more fully confirmed and pronounced. The classical division of the sac into two types—the true and the false—which has so long obtained in pathology is simply intended to indicate the preponderance or absence of the original arterial tunics in the composition of the sac. In all cases the absence of the media, with its elastic elements, is the characteristic feature of the sac. In the fusiform aneurisms of pathological origin (so-called spontaneous or idiopathic aneurisms) the sac walls essentially represent a continuation of the pre-existing coats

of the artery, *minus* the media, which is lost and cannot be recognized beyond the margins of the aneurismal orifices; the fibrous adventitia and endothelial intima are continued as extensions of the pre-existing coats of the parent artery. In the fusiform or saccular aneurism caused by direct injury to the artery (gunshot, punctured, stab, and other wounds) the sac is in its major part an adventitious product of new formation, in which, however, the newly-formed elements resulting from connective-tissue proliferation have assumed the fibrous and endothelial characteristics of the adventitia and intima of the parent artery. It follows from all this that, whether the sac be of purely traumatic or pathological origin, it can be regarded for surgical purposes as a prolongation or expansion of the affected vessel and, as such, is amenable to the same pathological reactions which characterize the normal blood-vessels when subjected to irritation. The absence of the elastic fibres of the media, which is so significant from the pathogenic point of view, is of no consequence to the surgeon, who is chiefly concerned when performing this operation in finding tissues that are capable of displaying sufficient reactionary and regenerative qualities, so as to obliterate the sac and its orifices when brought in close contact by sutures. These necessary plastic conditions are found in the smooth inner lining tunic of the aneurism which, as previously stated, is continuous with the intima of the arteries. In the larger and older aneurisms the inner surface of the sac loses, in places, its smooth, serous surface, but the identity of the endothelial intima is lost only in the distant and peripheral parts which are not in contact with the blood current, and where fibrinous deposits cover the altered and exposed basal membrane in the form of laminated clots. But even in these cases the orifices and their marginal areas for a considerable distance beyond retain the glistening, polished appearance characteristic of the endothelial layer of the intima. As the endothelial lining of the arteries and vascular system in general is a serous membrane of mesoblastic derivation like the peritoneum, pleura, etc., it manifests the same reactionary tendencies displayed by the serosæ when sub-

jected to irritation. The reaction of the intima to irritants is very much less than that of the peritoneum, and much more than that of the dura, being about midway between the two (Murphy). It follows, again, from what has been stated, that the aneurismal sac, with its fibrous basal membrane and endothelial intima (more or less modified by morbid agencies), can be properly regarded from the surgical view-point as a serous sac closely analogous to the peritoneal serosa, and, as such, capable of yielding the same plastic results which have been so helpful to the surgeon in his interventions in the abdominal cavity.

This concept of the sac is the basis of the method here described and successfully utilized by the author in securing the obliteration of the aneurismal pouch and its orifices by suture.

The application of the suture within the sac in the manner to be described is simply an application on a larger scale of the knowledge already obtained in other fields of arterial surgery. It is simply an adaptation of the principles of arterial repair and regeneration which underlie the daily application of the modern aseptic ligature, the suture of veins and the more recently introduced but fully recognized technique of circular and linear arteriorrhaphy. The only difference between these procedures and the one now under consideration is that in the later the arterial tunics are attacked directly from within the lumen of the arteries, or, rather, inside of their expansion in the aneurismal sac; and that the sensitive intima is utilized throughout by the infolding of its surfaces, and given the best opportunity to display its plastic qualities. This is the more apparent when we consider that the aneurismal sac is not detached in this procedure from any of its surroundings, and in this way its vascular supply and its vitality are not in the least impaired.

After this preliminary statement of the general histological and anatomical data upon which the operation is based, we are prepared to consider the method itself as applied in the most typical cases.

III.

STEPS OF THE OPERATION AS APPLIED TO PERIPHERAL ANEURISMS OF THE LARGER ARTERIES.

1. *Prophylactic Hæmostasis*.—The circulation of the limb should be controlled by preliminary elevation of the limb, followed by the application of the Esmarch elastic constrictor. Prophylactic hæmostasis may also be obtained when the aneurism is situated high up near the root of a limb (or in the neck) by exposing the main artery near the cardiac pole of the tumor and compressing it with a traction loop passed under the artery and held by an assistant. Pressure may also be applied over the exposed artery by the finger of an assistant after duly protecting the vessel with a pad of sterile gauze. The artery may be still better controlled by direct pressure with padded forceps: Billroth's forceps, with broad blades and graduated catch, the blades covered with rubber (Murphy, Burci); with a special clamp for this purpose (Crile's, Allegiani's, J. Tilden Brown); by ordinary spring clamps, such as Langenbeck's Serre-Plat's (Tomaselli), etc. I have found the simple silk traction loop to be the most convenient, because it is always at hand; but I believe that a properly-made clamp, permitting a careful adjustment of pressure, such as the Crile* or Allegiani† compressors, would be preferable. In carotid and other cervical aneurisms the collateral circulation is so free on the distal side that both poles of the tumor should be controlled, if possible, before opening it.

2. *Incision of the Skin and Exposure of the Sac*.—After all perceptible pulsation in the tumor has been arrested by the measures previously described, a free incision, parallel with the long axis of the aneurism, should be made down to the sac, exposing it to view from one end to the other. When the tumor is deeply seated under the skin, the sac should be exposed

* See Problems Relating to Surgical Operations. A New Method of Controlling Hæmorrhage in Certain Operations on the Head and Neck. By George W. Crile. J. B. Lippincott Co., 1901.

† See Umberto Allegiani, Il Policlinico, Roma, Anno 8, May 10, 1902.

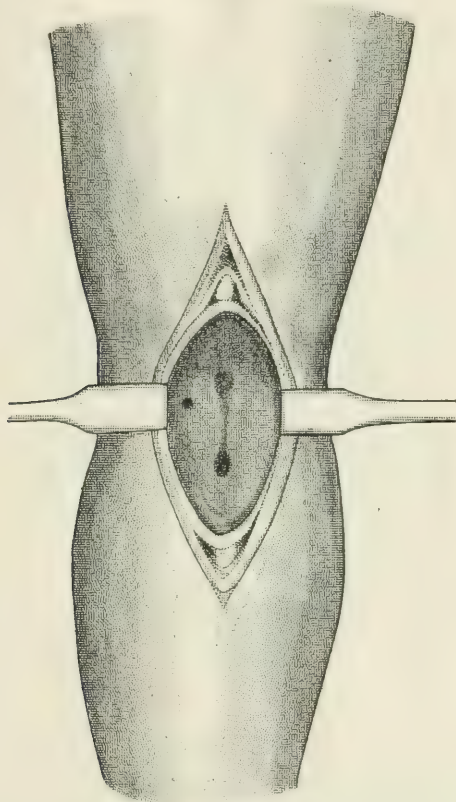
by careful dissection for some distance on each side of the cutaneous incision in order to identify any important structures (nerves, arteries, and veins) that might be adherent to its superficial surface. In any event this dissection should not be carried beyond the more prominent or superficial portion of the sac. If any important nerves or other structures should be found attached to the sac and in the way of a free longitudinal incision, these should be carefully detached and held out of the way with retractors.

3. *Opening of the Sac and Evacuation of its Contents; Recognition of the Type of Sac, Number of Openings, etc.*—A free incision is now made into the sac, extending from one extremity of the tumor to the other in its longest diameter and in the line of the main artery. The contained blood and clots are evacuated and the interior of the cavity is freely exposed to view by vigorous retraction of its edges. This will expose all the orifices which open into the sac. The type of sac that is being dealt with will now be disclosed. If it is a *fusiform* aneurism, two large openings will be seen, usually at the bottom of the sac, separated by an intervening space of variable length, frequently marked by a shallow groove which represents the continuation of the floor of the parent artery. This is more often seen in the aneurisms of the extremities than elsewhere. If the aneurism is of the *sacciform* type, there will be a single opening of variable size, circular or ovoidal in shape, which connects the sac with the main artery. The differentiation of the sac into the two fundamental varieties just described is most important in its bearings upon the further aims of the technique. In the spontaneous aneurisms of the *fusiform* type the artery blends so completely with the sac walls that its continuity cannot usually be restored, at least in the present state of our experience. In these cases the object of the suture is simply to seal the openings leading to the artery for the purpose of hæmostasis and obliteration of the sac. In the *sacciform* aneurisms, with a single opening leading to the main vessel, it is often quite possible to close the opening without encroaching upon the lumen of the parent vessel, thus

maintaining the functional as well as anatomical continuity of the artery.

We shall now consider separately the treatment of the first variety,—the *fusiform* aneurisms with two main openings.

FIG. 1.

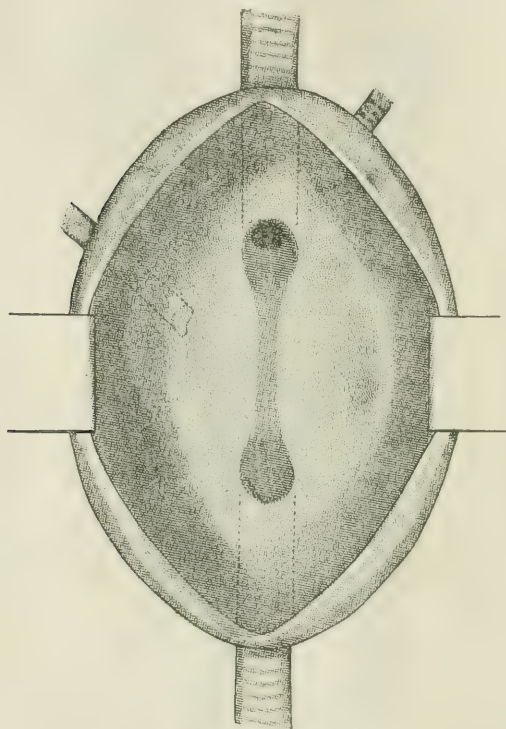


Aneurismal sac, fusiform type, with two orifices, as seen *in situ*, in the popliteal space. After controlling the circulation with the elastic constrictor the sac is exposed by dissection without disturbing it from its bed. A longitudinal incision is made from one pole of the tumor to the other. The edges are retracted, the clot removed, and the bottom of the cavity is exposed, irrigated, and made ready for the suture of the orifices seen in floor of the sac. The smaller opening of one collateral is shown on the left side.

At this juncture, while the interior of the cavity is exposed and after the chief openings have been identified, careful search should be made in the floor of the sac (especially in the fusiform aneurisms) to discover the openings of any col-

laterals or branches springing from the sac, which, if not carefully sutured, would give rise to troublesome hæmorrhage. Three of the cases operated upon by the author showed this peculiarity. If there is any bleeding from the orifices as a

FIG. 2.



Interior of large aneurismal sac of the fusiform type exposed by retraction. The two openings lead respectively to the parent trunk on the proximal (cardiac) and peripheral sides, and the groove between them represents the continuity of the arterial walls blending with the aneurismal sac. This was the type of sac observed in Cases 1, 2, and 4, reported in the text. The orifice of one collateral or branch originating in the sac is shown, and a large collateral opening into the main trunk near the orifice of communication, on the cardiac side, is indicated by the dotted line.

result of a free collateral supply, the closure of these openings by suture should be at once proceeded with. This kind of bleeding can only occur during the operation in cases in which the circulation of the sac is controlled solely by pressure on the cardiac side of the main artery, with a traction loop or

other contrivance, and not by general circular constriction at the root of the limb. Whenever the tourniquet or constrictor can be used the ischæmia is complete. The mechanism by which these bleedings are produced in spite of the most perfect control of the artery on the cardiac side is plainly shown in Figs. 1, 2, and 3, and especially in Fig. 17, which is intended to explain the unusual condition encountered in Observation 1. In this case, as well as in Observation 4, the most important bleeding appeared to come from the collaterals which emptied into the main artery between the point of compression and the orifices within the sac. Fortunately, this bleeding is readily controlled by pressure, which should be applied directly over the bleeding openings with the finger or sterile sponges until they are sealed by rapid, continued suture. When the hæmostasis is complete the interior of the sac should be gently, but thoroughly, scrubbed with gauze soaked in sterile saline solution, with the view to clearing it of adherent laminated blood-clots, which interfere with the healing of the sutured surfaces. This toilet of the sac also improves the circulation of the intima and prepares it for prompt plastic reaction when the surfaces of the sac are brought in apposition. In this respect the serous lining of the aneurismal sac, which is simply an extension of the intima of the parent artery, closely resembles the peritoneal serosa, and this, as is well known, unites more quickly when sutured after a preliminary irritation by rubbing, scarification, or abrasion.

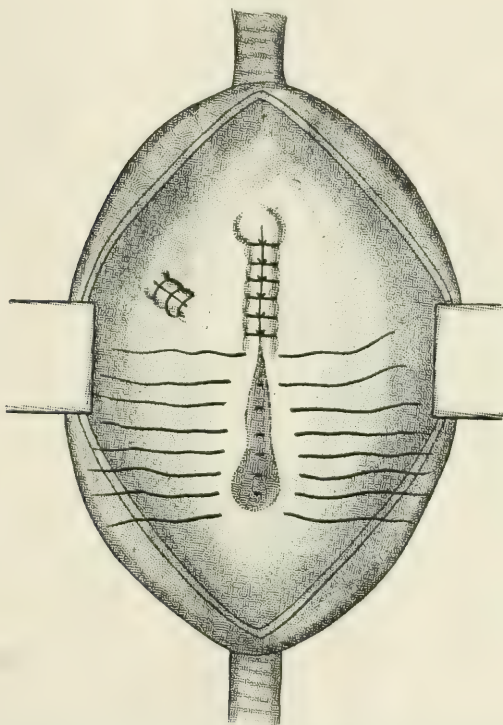
4. *Closure of the Aneurismal Orifices in the Fusiform Type of Sac.*—After the interior of the aneurism has been carefully prepared by this preliminary toilet the systematic closure of all the visible orifices opening into the sac by suture should be proceeded with, if this has not been done already, as in the conditions previously referred to. The tissues about the margin of these orifices are usually strong, firm, resisting, and hold the sutures well.

The orifices in the sac attached to the parent vessel are often large enough to admit the index-finger of the operator, and the margins are so thick that comparatively few sutures

will be required to bring them into apposition. The suture material may be either twisted, braided, or floss silk, chromicized catgut, or even the finest kind of kangaroo tendon; the size of the thread of whatever kind used should correspond with the size of the needle, and this in turn should vary in size according to the dimensions of the openings to be closed and the density of tissues to be sutured. I prefer absorbable sutures, and of these well-prepared chromicized catgut (Nos. 1, 2, and 3) is the best. This material is strong, and remains in the tissues long enough to accomplish its purpose. In applying the sutures the size and shape of the needle are important. The best needles are the round, full curved, with long eyes and prismatic points. Those designed for intestinal sutures are admirably adapted for the present purpose. The full curved needles, known as Mayo's, Kelly's, and Ferguson's, which are intended for intestinal work, are all excellent; but I have used the ordinary curved surgical needles, and even Hagedorn needles, with satisfactory results. As a rule, the continued suture will do well in all cases, especially when time is pressing. When the object of the suture is solely to seal the opening for hæmostatic purposes, and not to restore the caliber of the vessel to which it is attached, as is the case in saccular aneurisms, then the continued suture will be found to be not only the most rapid but the most effective. The distance which should separate the suture points should be regulated by the size of the opening to be closed. Eight or ten sutures to the inch are more than sufficient. In suturing wounds of *normal* arteries very fine needles and silk should be used, and the sutures should enter the vessel one-sixteenth of one-twentieth of an inch apart. In closing the orifices of aneurismal sacs the conditions are, however, altogether different, as aneurismal tissues are so much thicker and more easily approximated. What is more important is to secure a firm grip of the sac tunics so as to bring a broad surface in confrontation. In dealing with the larger openings in this class of aneurisms (fusiform), the needle should penetrate at least one-quarter or one-sixth of an inch beyond the margin of the orifice, and

then, after reappearing at the margin, dip again into the floor of the artery, and continue to the opposite margin as in the start (Fig. 3). This mode of occluding the orifice of the main artery will secure a very complete apposition of a large marginal area, including the floor of the artery which is visible

FIG. 3.



Shows the orifices in the aneurismal sac in process of obliteration by suture. The first plane of sutures may be made with fine silk, but chromicized catgut is preferred. The sutures are applied very much like Lembert's sutures in intestinal work; the first plane of sutures should be sufficient to secure complete hæmostasis.

The orifice of the collateral vessel on the left upper side of the sac is shown closed by three continuous sutures.

under the orifice. When the openings must be closed quickly, as in cases in which there is considerable bleeding from collateral vessels, the dip of the needle into the floor of the vessel may be omitted, and the margins of the orifices are brought together quickly with a continued suture. In suturing these

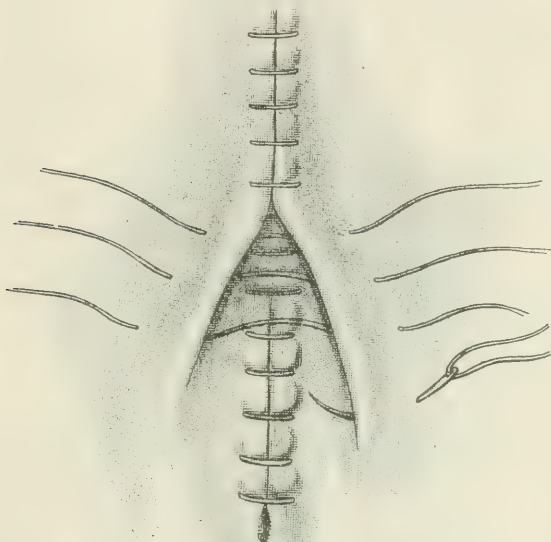
orifices the operator should act precisely as in closing perforations of the bowel covered with peritoneum, and remember that the principle of the suture is here, intima to intima or serosa to serosa, as in applying the Lembert suture to a perforated bowel. The one capital point of difference in the analogy is that the membrane dealt with is practically all serosa and that it is continuous with the interior of the artery to be closed; there is no mucosa or infection to be dreaded. Hence the invariable tendency of the tissues to heal by primary union and aseptic plastic endarteritis when brought together in broad and firm apposition.

Continuing with the technique of suture as applied to the *fusiform* aneurisms with two openings, I have found it advantageous to extend the first line of suture from one orifice to another when the intervening space is not too long. These sutures include the floor of the sac (Fig. 3), and are applied on the Lembert plan. They fold up and bring together a considerable area of the floor of the sac, which is thus raised to the upper level of the orifices; in this way they diminish not only the transverse diameter of the sac, but lay the foundation for the obliteration of the cavity which is to follow. If the floor is dense, rigid, or bound down by adhesions to unyielding parts (which is not often the case) the suture should be limited to the orifices. The subsequent steps in the technique will be considered further on in the text.

5. *The Sacciform Aneurisms with a Single Orifice of Communication; Hæmostatic and Reconstructive Suture with the View of Preserving the Lumen of the Parent Artery* (Figs. 8 and 9).—This type of sac is the most favorable for the display of the conservative value of arteriorrhaphy from every point of view. The intrasaccular suture of the orifice not only permits of the radical cure of the aneurism by closing its nutrient orifice, but also favors the restoration of the affected artery to its functional and anatomical integrity. The suture is here not only occlusive but reconstructive. The same material and needles should be used as in the previous case, the main point to bear in mind is that in introducing the sutures

these should be inserted at a sufficient distance from the usually thick and smooth margins of the opening in order to secure a firm and deep hold of the fibrous basal membrane (Figs. 10, 11, and 12). The needle should be made to appear just within

FIG. 4.



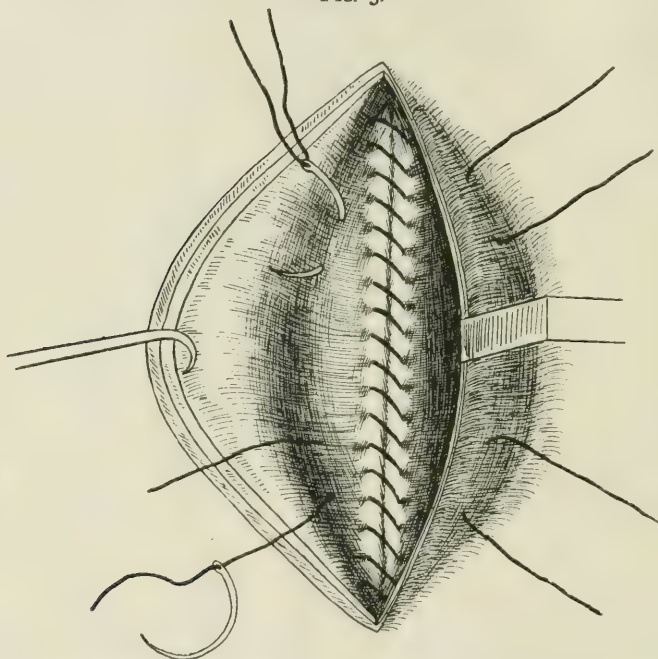
This shows a second row of sutures,—a technical detail of the operation which is advantageous, but not necessary in every case.

The first row of sutures has been completed and the arterial orifices have been obliterated. As the walls of the sac are usually relaxed, it is easy to insert a second series of sutures which add security to the first row, and, in addition, reduce the size of the cavity which is to be obliterated by inversion of the skin and surplus sac walls at a later stage in the operation. This second row of sutures is applied as in the first series, by either the continuous or interrupted method, with a curved needle, and Nos. 1, 2, or 3 chromic catgut. A large surface of the sac is thus brought in apposition, and the best opportunity given for adhesion by plastic or exudative endo-arteritis. If the floor of the sac is rigid or too adherent to the underlying parts, this second row may be omitted, and the operation can be advanced to the last step, —*i.e.*, obliteration of the sac after suture of the orifices.

the lower edge of the margin, care being taken that when the sutures are tightened the caliber of the artery will not be encroached upon so as to obstruct its lumen, and that the threads will not be brought in contact with the blood in the lumen of the

artery. Greater care must be exercised in securing accurate coaptation in this class of cases than in the fusiform type previously described. As shown in Figs. 10 and 11, it will be advantageous to begin the line of suture at some distance from the orifice, as this will secure a broader and stronger line of approximation. The larger the caliber of the parent vessel the more

FIG. 5.



Shows the details of the method of obliteration after the floor of the sac has been raised by the second row of sutures. Two deep supporting and obliterating sutures of chromic catgut are inserted through the floor of the sac on each side. The number of these sutures will vary according to the size and length of the sac that is being treated. In the smaller aneurisms, one of the deep sutures on each side will suffice; in others, two or more on each side may be required to keep the surfaces in close contact. After the sutures are passed through the floor of the sac the free ends of the threads are carried through the entire thickness of the flap by transfixion.

The plate shows the mode of placing these sutures on the left side preparatory to transfixion of the flap. The two sutures on the right side have been carried through a flap and are in position.

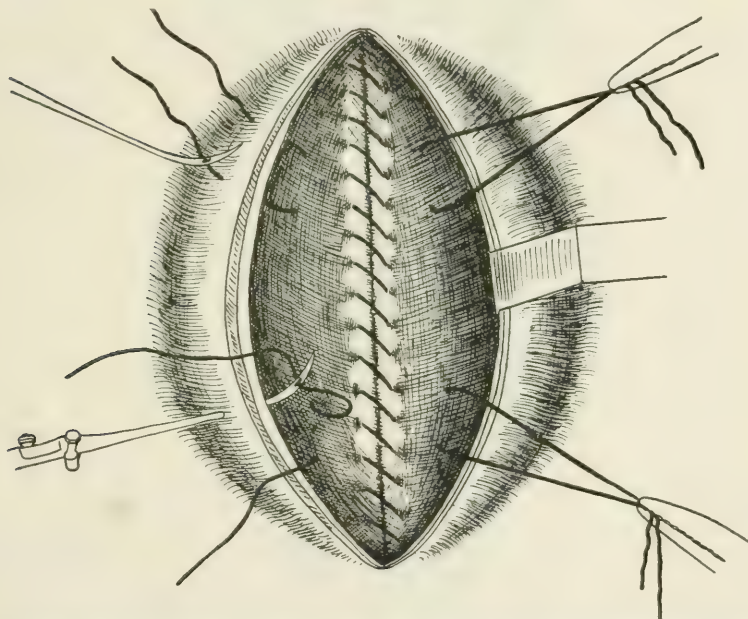
favorable will the conditions be for the restoration of the lumen of the artery and for the functional success of the operation.

6. *Removal of Constrictor and Test of Sutures.*—After all visible orifices in the sac have been closed by suture, the

constrictor or other provisional means adopted to control the circulation are removed. The interior of the cavity should now be perfectly dry, and the only change noticed by a return of the circulation should be an improved, more pinkish color of the sac. If there be any oozing capillary points these will be usually stopped by pressure and by the means subsequently adopted to obliterate the cavity.

7. *Obliteration of the Aneurismal Sac* (Figs. 4, 5, 6, and 7).—This step of the operation is the same in all cases. In

FIG. 6.

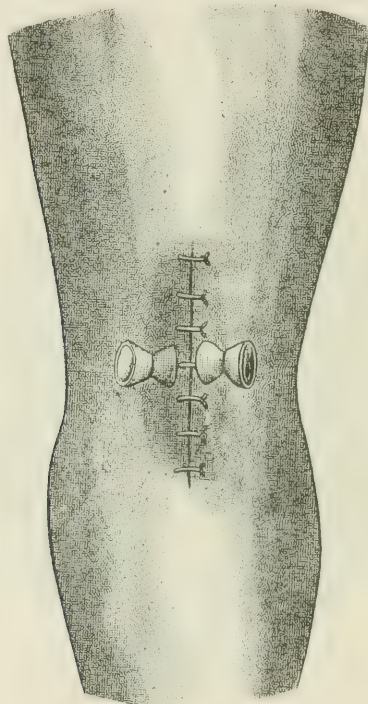


Shows the deep supporting sutures in position and the details of transfixion of the flaps. The Reverdin needle is used to carry the free ends of the threads through the flaps formed by the skin and aneurismal walls.

large sacs, where the floor of the cavity is deeply situated and there is an abundance or even redundancy of material, it will be a good practice, as previously stated, to reinforce the first line of occlusive sutures by a second row, applied also on the Lembert plan at a higher level. This second row will raise up and bring together a considerable surface of the sac floor and lateral walls of the cavity, and when finished will not only bury

the first plane of sutures, but will reduce the dimensions of the sac considerably (Fig. 4). The closure of the aneurismal space is now readily accomplished by turning the relaxed flaps of skin into the interior of the cavity. If the sac has not been previously dissected from its surroundings, the skin flaps will

FIG. 7.

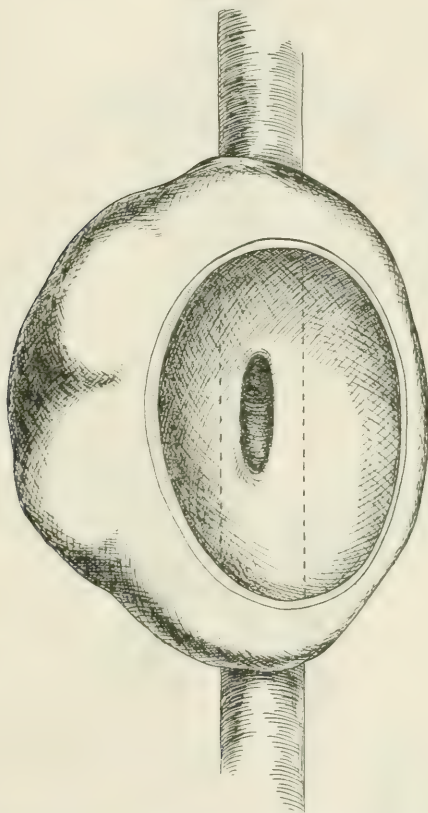


Shows the operation completed. In this figure only two supporting sutures are shown on each side instead of the four shown in the other figures. The skin and sac walls form two lateral flaps on each side of the incision, and readily fall to the bottom of the sac, thus lining and obliterating the entire cavity. A series of interrupted absorbable sutures are now placed so as to bring the edges of the skin in contact, several of these including the floor of the sac in their bight (as shown in cross section, diagram No. 13), so as to close the space entirely in the middle line. The two lateral supporting sutures are tied firmly over small pads or rolls of sterile gauze, thus bringing all the interior of the sac in apposition.

be lined on their inner surface with the smooth sac walls, thus constituting an aneurismo-cutaneous flap on each side. These flaps, in their relaxed state, can, as a rule, be made to touch the bottom of the cavity with comparative ease. One or two

relaxation sutures on each side of the median line will usually suffice to tack down and hold the skin flaps in contact with the bottom and sides of the sac. The sutures are best applied with a large size, full-curved intestinal needle, which is made to grasp a considerable portion of the sac wall in its bight. The

FIG. 8.



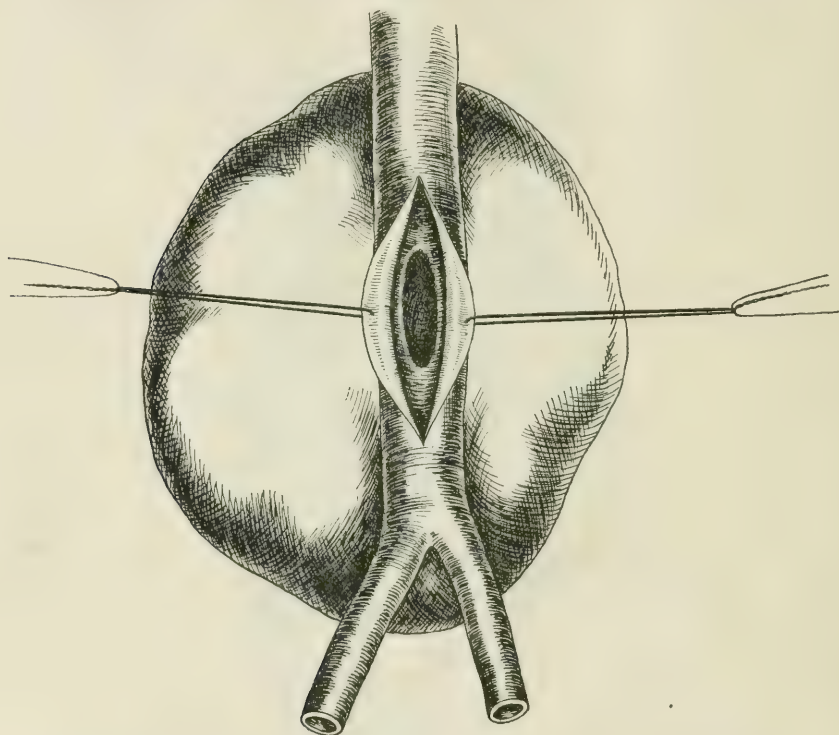
This shows a typical *sacciform* aneurism with one main orifice of communication opening into the sac. In this type of aneurism the lumen of the parent artery is maintained. It is possible in this class of cases to close the orifice of communication by suture without obliterating the lumen of the artery, and without interfering with the circulation in the main artery or of the distal parts supplied by it.

needle should penetrate through the entire thickness of the sac; by carrying it through in this way a loop is formed, the two ends of which are carried through the skin flaps by transfixion with a straight Reverdin needle, and tied firmly over a loose

pad of gauze after the flaps have been carefully adjusted in position (Figs. 5, 6, and 7).

The principle adopted in the obliteration of the sac has been made familiar by Neuber's method of closing bone cavities

FIG. 9.

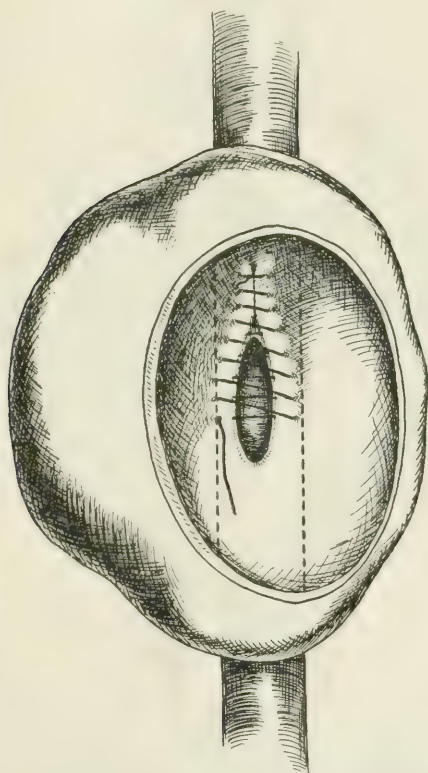


This figure is simply intended to show the same type of sacciform aneurism, viewed from the posterior side. The parent artery is continuous throughout, and is simply attached to the sac at the orifice of communication. The artery has been laid open on its posterior surface, showing that the orifice of communication can be closed on the aneurismal side, without occluding the lumen of the parent artery. The drawing is taken from a pathological specimen, and is utilized solely to show the favorable anatomical characteristics of this class of aneurism for the conservative procedure suggested by the author.

with cutaneoperiosteal flaps. After the relaxation sutures have been tied the edges of the skin should come in close contact in the median line, and all that will be required to finish the operation will be a few interrupted catgut sutures to complete the approximation of the skin margins (Fig. 7). When

the operation is completed, the aneurismal cavity is obliterated without in the least disturbing the sac or interfering with its vascular relations. The collateral circulation, which is usually important in the vicinity of the aneurism, is also respected, and in this way the best condition for the maintenance of a healthy

FIG. 10.



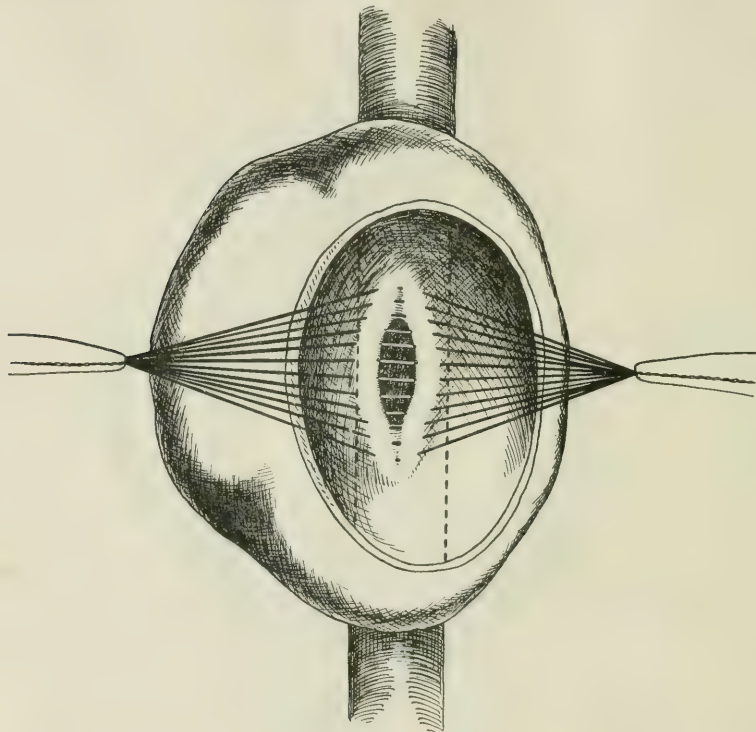
Shows the same sac opened. The dotted lines indicate the position and relations of the main artery to the sac and to the orifice of communication. The object of the operation in this case is to close the orifice of communication without obliterating the main artery. The closure of the orifice with continued suture is shown in the plate.

nutrition in the sac and in the parts beyond the aneurism are assured.

At the site where the bulging tumor previously existed there will be a depression varying in depth according to the size of the original sac, and presenting the appearance of an

inverted hollow cone or ovoid. As no exposed or raw surfaces are left in view, there is no need for drainage, and union *per primam* can be confidently expected, thus greatly abbreviating the duration of the after-treatment.

FIG. II.

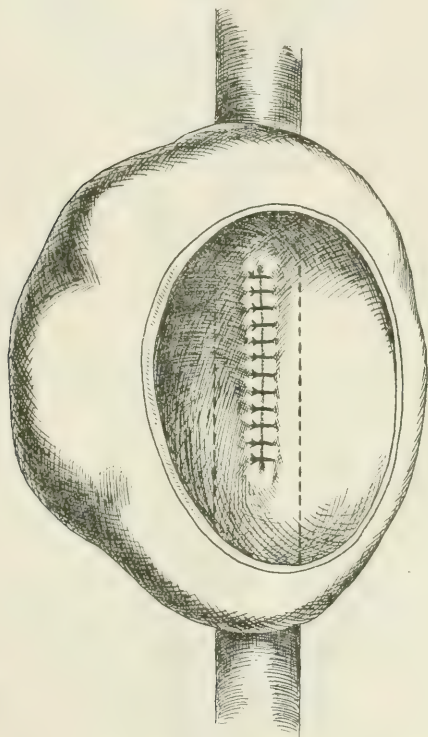


This shows the closure of the orifice of communication in the same type of sac with interrupted instead of the continued suture. Whether the continued or the interrupted suture be used (the former being preferred by the author), it is important to begin the suture line at some distance from the orifice, so as to infold a considerable surface of the sac at the start; then care must be exercised to insert the sutures so as to grasp a considerable surface of the margin, in a manner that the point of the needle shall penetrate the entire thickness of the margin, and yet not so far within the lumen of the artery as to encroach upon its caliber or to leave the suture material in contact with the blood current. When the sutures are tightened they should bring the marginal surfaces in broad apposition without projecting into the anterior portion of the artery or encroaching excessively upon the lumen of the vessel.

Dressings.—A simple sterile gauze dressing is applied as a graduated compress to fill the hollow left in the place previously occupied by the aneurism. This is held in position by a few strips of aseptic rubber plaster. The limb is then wrapped

up from the periphery to the trunk in a thick layer of cotton-batting, over which a well-padded splint is adjusted to secure the immobility of the entire limb, especially if the field of the operation occupies one of the flexures of the extremity. If suf-

FIG. 12.



Shows the obliteration of the orifice of communication completed. The appearance following the application of interrupted suture is shown in this figure. If the suture has been properly applied, the hæmostasis will be complete, and the circulation in the main artery restored. After this has been done, the second protective row of sutures shown in Fig. 4 and other details of the technique of the obliteration of the sac (shown in Figs. 5, 6, and 7) should be carried out precisely as in dealing with aneurisms of the fusiform type. Anomalous orifices or collaterals opening into the sac, in addition to the main orifices, are less liable to exist in the sacciform aneurisms than in the fusiform aneurisms, in which a large area of the arterial wall is involved. In any event, however, should such additional orifices exist, they should be individually closed by a few continued sutures, as shown in Fig. 3.

ficient padding has been applied to protect the distal parts from undue pressure or exposure to cold, a starch bandage or a light plaster-of-Paris roller over the whole limb will complete the

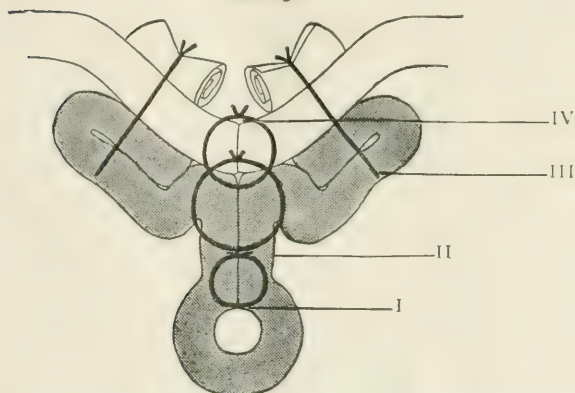
dressing. If there are no reasons to the contrary, the first dressing should not be disturbed for a period of a week or ten days.

IV.

ADDITIONAL REMARKS ON THE OBLITERATION OF THE SAC IN CERTAIN ATYPICAL AND EXCEPTIONAL CONDITIONS.

It is possible that in certain cases the obliteration of the cavity by inverting the walls of the sac with the overlying skin will not be practicable. This is more likely to be the case in the iliac and other abdominal aneurisms in which the sac is covered by peritoneum. In such a contingency the same object will be obtained by inverting the sac walls with the overlying peritoneum which covers the aneurism. The peritoneum is not to be separated by dissection, but is allowed to remain adherent to the sac, and is utilized in place of the skin flap with even greater ease and certainty of successful union than when the skin is used. The procedure is therefore precisely the same as that adopted in the typical surface cases, with the only exception that the peritoneum is used instead of the skin and that no gauze pads are used with the deep approximation sutures. Again, when operating upon deep-seated aneurisms of the extremities or neck, it may happen that in stout, well-nourished or muscular subjects, especially when the femoral or popliteal regions are involved, that the skin flaps will not stretch enough to reach the bottom of a deeply placed cavity without excessive tension. In such cases, rather than imperil the vitality of the skin by overstretching, it will be the safer plan to obliterate the sac itself with its own walls independently of the skin. The technique will then be the same as that described for the typical surface cases as far as the obliteration of the orifices is concerned, and the introduction of the second or protective row of stitches, as shown in Fig. 4; after this the excess of sac wall that remains above the second line of stitches is excised as superfluous, and the free edges of the sac are approximated by interrupted or continued catgut sutures. In this way the inner surface of the sac, including the orifices, floor, and part of the lateral walls are thoroughly approximated, and the sac is

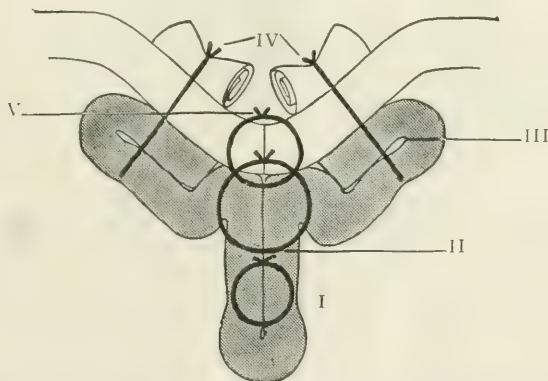
FIG. 13.



A diagram showing sectional view of the obliterated aneurismal sac when the lumen of the parent artery is preserved and the vessel originally communicates with the aneurism by a single orifice.

I, First line of sutures which close the orifice of communication and restore the lumen of the parent vessel; II, second row of protecting sutures which also reduce the size of the sac; III, supporting through-and-through sutures, which bring the roof and floor of the aneurism in contact; IV, sutures which hold the skin flap and sac in contact with the bottom of the cavity. This diagram will also show the result of the procedure illustrated in Figs. 15 and 16.

FIG. 14.



Sectional diagram showing method of obliterating the aneurismal sac in the *fusiform* type of aneurism with two openings. In this class of cases (Figs. 1, 2, and 3) the tunics of the parent artery blend with the sac, and the arterial channel cannot usually be restored.

The diagram shows the first row of sutures (I), which obliterates the orifice of the artery at the bottom of the sac. The second row of sutures is shown higher up (II), and also the effect of this row in reducing the capacity of the sac. The obliteration of the remaining part of the cavity by the folding in or inversion of the sac walls, with the attached overlying skin, is shown in III.

The function of the deep sutures (IV) tied over gauze pads, and of the more superficial skin sutures (V) in obtaining firm contact of the opposed surfaces, is also shown. This drawing is purely schematic; it gives an exaggerated idea of the size of the sac walls, and is chiefly intended to give an idea of the position of the sutures and other parts.

obliterated, but remains buried in the floor of the incision. It is easy then to close up the wound by bringing together all the soft parts by separate rows of buried sutures, including the skin incision, which is closed without drainage. It is most important to remember in all this work that the sac is dependent for its nutrition upon the vessels furnished largely by the perianeurismal tissues, and that any extensive dissection of the sac from its bed is likely to interfere with the reactionary processes so necessary for its obliteration. Therefore, it will be safer to excise those parts of the sac which have been detached by dissection from their vascular surroundings. One of the dangers of the old Antyllian operation was the tendency to suppuration and sloughing, which followed through a disregard of this precaution; the sac was often entirely lifted out of its bed, and allowed to remain in the wound after the vessels which communicated with it had been ligated. In this way it remained a foreign and dead body which taxed all the resources of nature to eliminate, and was the cause of endless trouble and even fatal disasters from infection and secondary hæmorrhage. No wonder, then, that after the advent of the aseptic period the surgeon should have discarded the old operation and turned with favor towards the radical operation with extirpation of the sac.

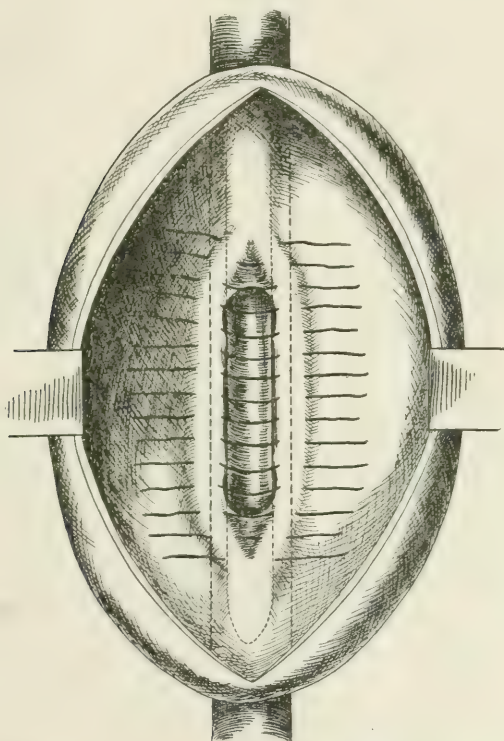
V.

SUGGESTIONS IN REGARD TO THE TECHNIQUE OF THE OPERATION IN DEALING WITH FUSIFORM ANEURISMS WITH TWO ORIFICES.

It will be noticed that in describing the various steps of the operation we have constantly kept in mind the two fundamental types of aneurisms,—the fusiform and the sacciform. The fusiform, in which the main artery communicates by two openings with the sac, is more often of pathological origin, the sacciform of traumatic causation. Both of these types, however, may be seen when aneurisms follow a direct injury of the artery, and when this is the case in the fusiform aneurisms the coats of the sac are not so diseased or degenerate as to prohibit a further conservative effort to restore the lost lumen of the

parent artery. In these fusiform sacs the practice of the author thus far has been to limit the intervention to the obliteration of the orifices where they blend with the sac and to suture them in the manner previously described. While writing this paper, the thought has suggested itself that it would not be impracticable or unreasonable when favorable

FIG. 15.

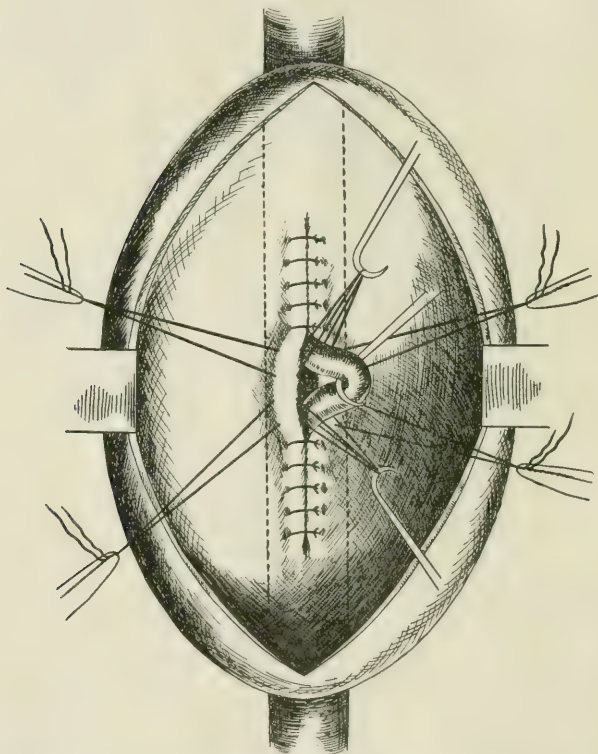


Shows a possible but not yet tried method of restoring the large lumen of the parent artery in favorable cases of fusiform aneurism with two openings in which the healthy and flexible character of the sac will permit of the restoration of the arterial channel by lifting two lateral folds of the sac and bringing them together by suture over a soft rubber guide. The principle of this operation is precisely like that adopted in a Witzel gastrostomy. The figure shows the soft rubber catheter lying on the floor of the sac and inserted in the two orifices of communication. The sutures are placed while the catheter is in position acting as a guide.

conditions presented themselves, as is apt to be in the larger aneurisms, which offer an abundance of material and a flexible floor, to go a step further and to re-establish the lost arterial

channel by the procedure shown in Figs. 15 and 16, and in sectional diagram 14. The principle of this operation is precisely that adopted in Witzel's method of gastrostomy. As shown in Fig. 15, a soft-rubber catheter or tube, corresponding in diameter to the size of the parent artery, is laid on the floor of the sac, and is inserted as a guide in the two orifices of

FIG. 16.



This shows a more advanced step of the procedure described in Fig. 15. The sutures are nearly all tied, and the new channel is completed except in the centre. The two middle sutures are hooked and pulled out of the way while still in position, and the catheter is withdrawn. The obliteration of the sac and final steps of the operation are carried out precisely as previously described in Figs. 4, 5, 6, and 7.

communication. Two lateral folds of the sac are now raised from the floor on each side of the catheter by means of two sets of sutures introduced on the Lembert plan. These ridges or folds should be raised high enough on each side of the guide

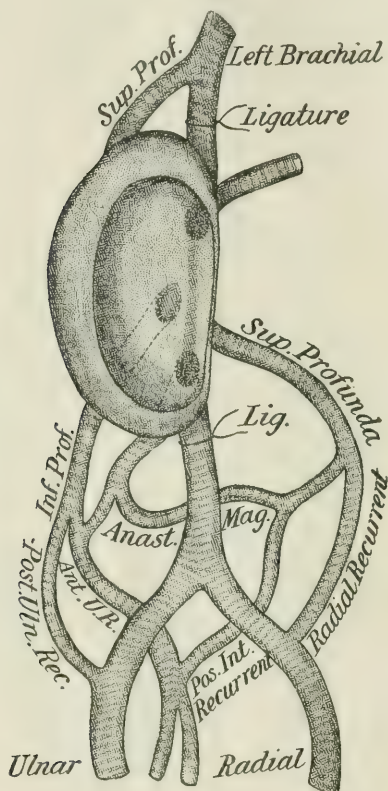
to cover it completely in the middle line. A row of sutures should now be placed in a series from one of the main orifices to the other, leaving the catheter *in situ* until all are placed. The subsequent steps of the procedure are shown in Fig. 16. The sutures are all tied except those in the centre of the line of union, which are not tied until the guide has been removed. When possible a second superimposed continued line of sutures should be applied over the first step, as is shown in Fig. 4, illustrating the typical procedure. In this way a continuous channel is established which connects the main orifices of communication and permits the blood to flow directly and uninterruptedly through the tract of the parent vessel to the distal parts. While it is evident that this suggestion is only applicable to certain favorable cases, its practicability and the great object to be gained by its accomplishment should not be overlooked, more especially in the great aneurisms at the root of limbs and in the abdomen, where the conditions justifying its performance frequently exist.

VI.

My experience with this method of endoarteriorrhaphy, or, rather, to define it more accurately, endoaneurismorrhaphy, if I may be permitted such a neologism, is limited to four cases: two of direct traumatic aneurism of the brachial, caused by gunshot wounds, one of which involved the lower and the other the upper third of this artery; one femoral and one popliteal, and both of the so-called spontaneous variety. The first operation dates as far back as March, 1888, and was published in the *Medical News* in the issue of October 27, 1888. This case presented features of exceptional interest apart from the method of treatment employed. It is one of the cases of traumatic aneurism of the brachial caused by gunshot wound. In this case (a very large sac) indirect and direct compressions by Reid's method were tried unsuccessfully; then ligatures were applied above and below the sac at different sittings, and failed: the pulsation returned on the tenth day. Upon opening the aneurism its rebelliousness was explained by finding

the openings of several large collaterals which kept up the circulation in the tumor after the main artery had been ligated above and below the sac. The anastomotic circulation which

FIG. 17.



This is a reproduction of a diagram published in the *Medical News* (Philadelphia), October 27, 1888. It is intended to explain the condition found in a case of traumatic aneurism in which the author applied intrasaccular arteriorrhaphy for the first time. The abundance of the collateral supply in that case could only be accounted for by a distribution of the vessels such as shown in this figure.

The failure of the ligatures applied to the main artery above and below the sac and difficulties of extirpation were well illustrated in this case, and led to the suture of the aneurismal orifices, which promptly secured their obliteration and an immediate arrest of the hæmorrhage.

accounted for this unusual condition is explained by Fig. 17, which is reproduced from the original article. In this case (a large aneurism of the fusiform type) extirpation was at-

tempted, but had to be abandoned because of the great risk of injuring adherent nerves which were incorporated in its walls. Under these circumstances, and without any previous knowledge of the practicability of suture in such cases, all the bleeding was immediately controlled by suturing the orifices with fine silk. A redundant portion of the sac which had been detached by dissection was excised, leaving the floor and lateral walls undisturbed, to heal by granulation. A long interval elapsed between this and the next case, which was operated by more advanced technique in the summer of 1900; several opportunities had presented themselves in the interval for the application of this method, but I had not yet overcome the dread of atheroma and secondary hæmorrhage. But the disastrous results which followed in a case of femoral aneurism treated by Hunterian ligation, in which the patient barely escaped with his life after an amputation at the thigh for gangrene, and also the vivid recollections of the great difficulties encountered in extirpating a femoral aneurism of Scarpa's triangle, followed also by gangrene of the toes, led me to revert to the method of incision and suture detailed in the previous case. After this experience I grew more confident, and applied the operation with more boldness, and added the modifications referred to in describing the technique of obliteration.

While this experience is too limited to justify any dogmatic or broad generalizations, the simplicity of the method and the favorable results thus far obtained are sufficient to encourage its more general application. The later suggestions and modifications made in this paper, which aim at the further conservation of the main trunk, and thus safeguarding the integrity of the circulation in the sacciform and fusiform aneurisms, are still waiting the test of clinical experience. But from *a priori* grounds and the experience thus far gained, it would appear quite reasonable to anticipate still greater gains in a conservative direction in a group of cases in which the classical procedure is still fraught with great uncertainty.

As the chief object of this paper has been to describe the technique of this procedure and to relate the author's personal

experience in its practical application, no systematic effort will be made to study its comparative merits in relation to other methods of treating aneurisms. The indications for the application of this operation have been sufficiently stated. It is intended to meet the conditions which call for the radical operation by extirpation. It is not intended to supplant it altogether, because extirpation is still the method of election in dealing with the smaller aneurisms of the secondary arteries of the extremities, in which the question of mortification or gangrene does not enter into consideration on account of the certainty of an abundant vascular supply. Its chief object is to simplify the technique of the radical cure, to make it less bloody, to diminish the traumatism, to interfere less with the important neighboring structures, which are often damaged by extirpation (veins, nerves, and organs), and, above all, to reduce the dangers of gangrene of the distal parts to the strictest minimum compatible with the cure of the aneurism.

It is only just to state that after a careful inquiry into the literature of aneurism I have failed to find any reference to a procedure that resembled or suggested the method described in this paper. In the constantly growing list of contributions on the subject of arterial suture there are frequent allusions and suggestions as to the possible advantages of suture in the treatment of traumatic and arteriovenous aneurisms. These recommendations all refer to the direct suture of the artery in recent wounds or at the bottom of diffuse extravasations and pulsating hæmatomas in which no well-circumscribed sac exists. The three reported cases of arteriovenous aneurism in which the arteries had been detached from the veins and sutured by lateral and circular arteriorrhaphy have been mentioned at the beginning of this paper. These cases, however, represent conditions which are entirely different from those under consideration. A single exception that I have found in the literature of the subject is the notable contribution by J. B. Murphy, of Chicago, on the resection of arteries and veins injured in continuity (*Medical Record*, New York, January 16, 1897), in which he boldly and very originally discusses the practicability

of attacking fusiform aneurisms by *extirpation* of the sac and suture of the arterial orifices. He divides the indication for arteriorrhaphy into four groups: (1) Injuries to large vessels in operations; (2) injuries of large vessels from stab, puncture, bullet, or lacerating wounds; (3) traumatic and dissecting aneurisms; (4) sacculated, fusiform, and arteriovenous aneurisms. His remarks on groups 3 and 4 are so apposite to the present subject that they justify full quotation, as they bear the stamp of authority vested by an unusually large experimental and clinical experience in arterial surgery. He says: "In traumatic aneurisms of long standing we have the best variety of cases for arterial suture. The opening in the artery is usually small, the arterial wall is healthy, and a sufficient quantity of aneurismal stump may be retained to produce a firm line of approximation. From a theoretical stand-point, as well as from the results of experiments, there is no danger of the formation of aneurism at the point of primary suture for injuries, and should not be for secondary sutures, as in aneurisms of this class. The vessel should be exposed above and below the aneurism, and temporary hæmorrhage obtained by a very mild compression forceps. The aneurismal sac should then be freely opened and dissected down to the position of the opening in the artery. The edges of the artery should be freshened and closed, the same technique being observed as in primary suture. In the fourth class of cases—*i.e.*, sacculated, fusiform, and arteriovenous aneurisms—the aneurismal sac should be exposed and dissected down to the healthy coats of the artery, where it should be amputated, leaving sufficient of the aneurismal coat and arterial wall to allow a row of sutures involving one-sixteenth of an inch of the margin on either side, so that when the suture is complete the size of the vessel will be below its normal caliber. This lessens the arterial pressure of the vessel at that point, and there should follow a union of the wall," etc.

This, I believe, is the first specific statement that has been published describing a general method of dealing with aneurisms by suture, though I had used the method of suture in the

obliteration of the orifices of an aneurism, and published a full account of the case nearly ten years before the publication of Dr. Murphy's experimental contribution.

It will be seen, however, by the quotations above given that Dr. Murphy's procedure, bold and brilliant as it is in its conception, is entirely different from that described in this article. Murphy's suggested operation is practically an extirpation of the sac, and as such is fraught with all the difficulties and undesirable features of this operation, with the added difficulty of suturing the openings in the vessel itself. He has also overlooked the fact that in fusiform aneurisms the continuity of the main artery is lost for a considerable distance in the sac, where it merges completely with the aneurismal walls; hence the impracticability of resecting the sac by the method he suggests. In the sacciform and the arteriovenous aneurism his procedure is perfectly feasible, but the same result can be accomplished by the much easier and safer plan described in this contribution.

VII.

In conclusion, the writer would submit the following propositions:

1. That the recognized advantages of the radical operation for the cure of aneurisms of the peripheral arteries, as demonstrated by the statistics of the last decade, can be greatly increased, and the sphere of application of this operation can be broadened by the adoption of the method of suture and obliteration of the sac instead of the classical ligation of the arteries, with or without extirpation, as hitherto practised.

2. That the closure of the arterial orifices which supply the aneurismal sac, whether these be single or multiple, by means of suture, and within the aneurismal sac itself, greatly simplifies the technique of the radical operation, and is a reliable means of securing hæmostasis.

3. That in favorable cases—and the saccular aneurisms with a single orifice communicating with the lumen of the larger arterial trunks are the most favorable—it is possible, by careful suture, to obliterate the aneurismal opening without obstruct-

ing the lumen of the parent artery, thus protecting the limb from the risk of gangrene.

4. It is also possible in favorable cases of fusiform aneurisms of traumatic origin, and in all those in which the sac material is healthy and pliable, to restore the lost continuity of the artery by building a new channel which will connect the two main orifices of communication and restore the interrupted circulation in the parent vessel. This result can be obtained by utilizing the sac in the manner previously described by the author.

5. That the fear that atheroma and other degenerative changes will interfere with the healing and repair of the arterial tunics has been greatly exaggerated is shown by the abundant experience of the aseptic period in the ligature of sclerotic arteries in continuity, in the absence of secondary hæmorrhage in the amputated stumps of the aged, diabetic, and other arterially diseased subjects (Heidenhain, Webber, Barwell, and others), and is still demonstrated more fully by the observations and statistics of the partisans of the radical operation by extirpation (Delbet, Kubler, Ransohoff, Annandale, and others) who have reported numerous successful results in spontaneous as well as in traumatic aneurisms.

6. The fallacy and dangers of the old operation of Antyllus lie (*a*) in the fact that the preliminary ligation of the main artery above and below the sac will not always control the bleeding from the collaterals which often open into the aneurism or into the main trunks between the orifices in the sac and at the seat of ligature. This compels a more or less extensive dissection of the sac out of its bed as one of the necessary features of the procedure, in order to secure all the collateral vessels that empty into the sac, unless the uncertain process of plugging the openings and packing the sac itself is resorted to. If the sac is dissected, as is usually done to secure the collaterals, the difficulties of the operation are increased, and the vitality of the limb is endangered by interfering with the collateral circulation which, in many types of aneurism, is most freely developed in the neighborhood of the sac.

(b) Another serious objection to the old Antyllian operation as usually performed is that the sac is allowed to remain as an open cavity in the bottom of the wound, where it is packed or drained and allowed to heal by granulation. This invites infection, suppuration, and its attendant dangers of secondary hæmorrhage; all that is obviated by the author's method of endo-aneurismorrhaphy, which does not disturb the sac from its vascular connections, and favors its prompt obliteration by suturing the infolded walls of the sac, and keeping them in direct and close approximation.

7. The uncertainties and dangers of extirpation of the sac (Purmann's operation) are even more apparent than those of the Antyllus operation, because, in addition to the greater technical difficulties of extirpation, there is much greater risk of injury to the accompanying satellite veins and nerves which blend most intimately with the sac, and often compel the operator to limit his intervention to a partial extirpation, leaving behind a considerable portion of the sac wall in order to avoid injury to important adherent structures. The greatest objection to extirpation, however, lies in the decided interference with the collateral circulation in the immediate vicinity of the aneurism, which entails a considerable risk of mortification in the distal parts. All these dangers are reduced to a safe minimum, and are largely eliminated by simply obliterating the sac, instead of extirpating it.

[NOTE.—In this abridged article the detailed clinical histories of the author's four cases operated upon by the method described in the text have been omitted. The clinical reports are published in full in the volume of *Transactions of the American Surgical Association* for 1902, to which the reader is referred for the complete text and discussion.]

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¹ Medical Record, New York, January 16, 1897.

² *Riforma Medica*, 1898, Vol. iv, No. 125.

³ *Berliner klinische Wochenschrift*, 1895, No. 34.

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CASES ILLUSTRATING SOME IMPORTANT POINTS IN THE DIAGNOSIS AND TREATMENT OF ABDOMINAL CONTUSIONS ASSOCIATED WITH VISCERAL INJURIES.¹

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CONTUSIONS of the abdominal wall and lower segment of the thorax constitute a fair proportion of the injuries received in the accident rooms of our large general hospitals. These injuries result from a great variety of traumatisms, such as blows, kicks, falls, crushes, railway accidents, and the passage across the trunk of the wheels of a truck or other heavy vehicle. They are not infrequently associated with other lesions, as fractures of the ribs or of the extremities, dislocations, head or spinal injuries, the symptoms of which may completely overshadow those of the abdominal lesion and cause it to be overlooked. In these cases there is frequently no history of an injury to the abdominal wall, no mark of traumatism, and no complaint of abdominal pain.

The results of an uncomplicated abdominal contusion may vary from a slight feeling of soreness or general discomfort, with or without an insignificant bruise or ecchymosis of the skin, to a rapidly fatal collapse. This difference, which is not infrequently observed in injuries quite similar in their method of production, in the amount of force expended and in their outward signs, is due to the presence or absence of associated visceral injury.

The effects of a blow on the anterior abdominal wall are modified by the condition of the abdominal muscles. An unexpected blow on the pit of the stomach received while the muscles are in a state of comparative relaxation is often followed by severe shock, nausea, and temporary muscular weakness, due.

¹ Read before the New York Surgical Society, October 22, 1902.

as Crile has shown, to the concussion being transmitted to the pericardial portion of the diaphragm. If, however, the blow is expected and the abdominal muscles are rigidly set, little or no inconvenience is experienced. The same is true in other parts of the abdomen; an expected blow or contusion produces as a rule less visceral injury than one received while the abdominal wall is relaxed. A blow directly over a distended hollow viscus, as the stomach or urinary bladder, will frequently cause a rupture of that organ, and extravasation of the contained matter, while the same blow received during collapse of the organ would produce no untoward effect.

Enlargements of the liver and spleen to such an extent that they lie below the protecting arches of the ribs favor their injury as a result of abdominal traumatism.

It must be remembered that extensive and fatal visceral ruptures may be produced by comparatively slight contusions, and that the amount of internal injury is due more to the condition of the organ and the protecting abdominal muscles than to the force of the blow.

The lesions produced by an abdominal traumatism may be divided into two general classes,—the *extraperitoneal* and the *intraperitoneal*.

The extraperitoneal results of abdominal contusions are bruises of the skin; subcutaneous ecchymoses; hæmatomata beneath the skin, between the muscular layers or between the muscles and the peritoneum; rupture of the muscles at their points of attachment or in the intervening portions; contusion or rupture of the kidneys. The intraperitoneal injuries may be a contusion or rupture of the parietal peritoneum; contusion or rupture of the stomach or intestine; contusion or rupture of the liver, spleen or pancreas, and injury to the omentum or mesentery. Ruptures of the bladder may or may not involve the peritoneal cavity.

In rupture of any portion of the alimentary canal, immediate extravasation of the contained matter will result, producing, as a rule, at first, symptoms of peritoneal irritation, as localized pain, tenderness, vomiting, and muscular rigidity, and

later followed by symptoms of peritonitis, generally of the spreading variety, and characterized by an increase in the severity and area of the pain, tenderness, and muscular rigidity, with fever, prostration, meteorism, and the occurrence of a marked leucocytosis, leading rapidly to a fatal termination, unless speedily relieved by surgical procedures.

Injuries of the liver and spleen following abdominal contusions are generally found to be more or less extensive fractures which result in the extravasation of blood which varies in amount with the extent of the injury. The commonest seat and direction of the fissure in cases of rupture of the liver are along the falciform or coronary ligaments. They may extend to any depth, and often nearly bisect the organ. In the deeper fissures the hæmorrhage may be so rapid and extensive as to produce immediate death or symptoms of complete collapse. In fractures of the spleen, the direction of the rent is generally that of the large blood-vessels, and is therefore from the external surface, the anterior or posterior border of the organ, towards the hilum. On account of the great vascularity of this organ, even small tears frequently give rise to severe and often fatal hæmorrhages. In ruptures of the kidney the line of fracture also corresponds, as a rule, with the direction of the blood-vessels. When limited to the cortex, the hæmorrhage is moderate; but when complete rupture occurs, the larger vessels are torn and the hæmorrhage is profuse, often forming enormous retroperitoneal hæmatomata, and also intraperitoneal extravasations in case that membrane is torn by the original traumatism. When the pelvis or ureter is injured, urinary extravasation necessarily occurs, giving rise to a gradually increasing tumor of the flank, which not infrequently becomes infected, forming extensive perirenal suppuration.

In rupture of the bladder from a blow over the distended viscus, the tear may be extraperitoneal, intraperitoneal, or may be both extra- and intraperitoneal. If the injury is limited to the bladder, the symptoms may be only those of a slight transitory shock and those of moderate peritoneal irritation caused by the extravasation of the urine into the peritoneal cavity,

followed later by a progressive peritonitis. If, on the other hand, the rupture is due to a fracture of the pelvis, the rupture is more generally in the extraperitoneal portion of the bladder, and is frequently caused by the driving inward of a fragment of a broken ramus. The same injury frequently causes rupture of the large vessels of the pelvis, giving rise to a hæmorrhage, which, if severe, may produce symptoms of shock which may completely mask the initial evidences of peritoneal irritation.

Injuries of the omentum and mesentery are rarely found unassociated with other visceral lesions. When present, the symptoms are generally those of extensive hæmorrhage and peritoneal irritation.

The older writers upon surgery were accustomed to refer to shock as the chief symptom of injury of the abdominal viscera, and taught that even slight injuries of the solid or hollow organs of the abdomen were invariably associated with a severe degree of shock. Since surgeons have adopted the plan of early exploratory operation in abdominal traumatism, it has been found that this view is erroneous, and that gunshot, stab, or other limited wounds of the liver, spleen, pancreas, stomach, intestine, etc., unless accompanied by severe hæmorrhage or extensive extravasation, rarely give rise to a more than slight and transitory shock, and that rupture and even severe lacerations of these organs occasionally occurs with no more shock than would be expected from the superficial contusion.

Crile, in his masterly essay entitled "An Experimental Research into Surgical Shock," has shown that certain organs and tissues of the body, when injured, seem to give rise to a far greater degree of shock than others, and in experiments upon the abdominal viscera found that injuries involving the diaphragm, especially that part attached to the pericardium, gave rise to a relatively greater degree of shock than similar injuries elsewhere; that injuries involving the pylorus, duodenum, and upper segment of the small intestine produced more reaction than injuries of the lower portion of the alimentary canal and the solid viscera; that severe traumatism of the female pelvic organs frequently occurred with practically

no evidences of shock, while injuries of the external genitals, especially in the male, produced often a degree of shock seemingly wholly out of proportion to the degree of the injuring force.

In general, he found that "the more specialized and abundant the nerve supply to a part, the more will it contribute to the production of shock when subjected to injury."

The occurrence of hæmorrhage in connection with visceral injury, if extensive, will give rise to an accentuation of the initial shock, and if continuous, will produce progressive weakness, pallor, weak pulse, thirst, restlessness, cold perspiration, air hunger, syncope, and death.

These symptoms, and also those of peritonitis, are valuable when present, but are often absent in the first few hours following the injury, at a time when the diagnosis should, if possible, be made, and any operative procedure for the relief of the condition should be undertaken.

From the observation of some twenty cases of visceral injury following abdominal contusions, verified by operation or autopsy, the writer finds that of the symptoms present in the earliest stages of an abdominal injury, pain, tenderness, and muscular rigidity are the most prominent, and are most to be relied upon to establish the diagnosis. Deep-seated localized pain following an abdominal contusion, especially if increased by pressure and accompanied by local or general muscular rigidity, is one of the most constant symptoms of intra-abdominal injury. The association of these three symptoms is almost pathognomonic of peritoneal irritation. Pain, however, is often present with tenderness in injuries limited to the abdominal wall, but in these cases the muscular rigidity is generally absent. In the absence of spontaneous pain, localized tenderness with rigidity is strongly suggestive of visceral injury. Of the three symptoms, however, muscular rigidity is the most reliable, and is sometimes the only sign present. In the absence of other diseased conditions, spasm of one or more of the abdominal muscles following a traumatism may be looked upon as nature's effort to protect an injured organ from further irritation.

Vomiting is a symptom occasionally present in abdominal injuries. It is not, however, as formerly taught, always the accompaniment of a severe visceral injury. It is commonly present in injuries involving the stomach and upper part of the intestinal tube, and in injuries accompanied by severe shock.

The occurrence of free fluid in the peritoneal cavity, evidenced by the presence of flatness in the flanks which disappears when the patient is turned to the opposite side, is a valuable sign when it can be demonstrated. The presence of a large amount of fluid faeces in the colon may rarely give rise to the same signs and lead to error. Free gas in the peritoneal cavity is also a valuable indication of rupture of the alimentary canal. In the absence of meteorism, this would be indicated by abnormal tympanites and an obliteration of the liver dullness.

Regarding the possibility of a more specialized diagnosis, it is the writer's experience that in these severe injuries the signs and symptoms are rarely so localized and characteristic as to warrant a positive diagnosis of the exact nature of the lesion. It occasionally happens, however, that the signs point strongly to injury of one or the other of the viscera.

If, following an abdominal contusion with or without evidences of superficial injury, there are localized pain and rigidity over the epigastrium with the presence of free gas in the peritoneal cavity, a rupture of the stomach may be suspected. If, under the same circumstances, there is pain and tenderness limited to the right hypochondriac region and rigidity of the upper half of the right rectus muscle, with free fluid in the peritoneal cavity, and with a progressive weakness, pallor, cold perspiration, restlessness, air hunger, thirst, and a rapid, weak pulse, rupture of the liver with severe hæmorrhage is to be inferred. The same symptoms and signs limited to the left hypochondrium suggest a rupture of the spleen. Pain and rigidity about the umbilicus or in the lower part of the abdomen without other symptoms suggest rupture of the intestine. The diagnosis is rendered more probable if, in addition, free gas can be demonstrated in the peritoneal cavity.

Pain in the hypogastrium, with vesical tenesmus and the passage of a small amount of bloody urine or an empty bladder, indicates rupture of that organ, while pain in one flank, with hæmaturia and the formation of a retroperitoneal exudate, suggests contusion or rupture of the kidney.

To illustrate the above-mentioned points in the special diagnosis of these injuries, I desire to report briefly a few cases selected from a much larger number operated upon during the past three years, which will furnish examples of both typical and atypical cases of the several classes.

CASE I.—Rupture of the liver, exhibiting symptoms and signs sufficiently typical to warrant a probable diagnosis.

A. B., male, aged forty years, was admitted to the Roosevelt Hospital in the fall of 1890, having sustained a severe contusion of the right side of the thorax and abdomen. On admission he exhibited the evidences of severe shock,—pallor, cold extremities, a weak, rapid pulse, cold perspiration, and great restlessness. The abdomen was everywhere rigid; tenderness was present over the lower portion of the right thorax and in the right hypogastrium. There was flatness in both flanks, which disappeared on changing the position of the patient. Liver dulness present; bladder emptied by catheter; no hæmaturia. The patient had vomited once or twice.

After vigorous stimulation and a hasty preparation of the abdomen, chloroform was administered, and the abdomen opened by an incision through the outer border of the right rectus muscle. The peritoneal cavity contained a quart or more of fluid blood and clots; a large rent was found in the convex upper surface of the liver, which was packed with gauze. The abdomen was cleansed by washing with a large amount of normal salt solution and the wound partly closed.

The patient rallied well after the operation, and for four days appeared to be progressing favorably. The temperature remained at or near the normal line, and the pulse gradually diminished in frequency and improved in volume and force. He took nourishment and the bowels moved. On the fourth day the temperature and pulse rose; tympanites and vomiting appeared, and he subsequently died of peritoneal sepsis.

CASE II.—A brakeman, twenty-eight years of age, received a blow on the abdomen in a railway accident. He was unconscious for a few moments as a result of the blow, but quickly recovered, and when brought to the hospital complained only of pain at the umbilicus. There was no vomiting. He was somewhat pale, the pulse was rapid, but showed no other evidences of marked shock. Examination showed well-marked rigidity of the right rectus muscle and tenderness over its upper third. Dulness in both flanks. The patient did not give the appearance of one severely injured, and considerable difference of opinion existed among those of the staff who examined him as to whether he had a visceral lesion or only a severe contusion of the abdominal wall. He was, however, immediately prepared for operation, and under ether anæsthesia an incision was made through the upper portion of the right rectus muscle and the peritoneal cavity opened. As soon as the peritoneum was incised, a large quantity of blood escaped, apparently from the direction of the pelvis. The incision was hastily enlarged, so that it extended from the thorax to the pelvis, and the intestines retracted, exposing the pelvic cavity, which was filled with clotted blood. This was hastily removed, but quickly refilled. Considerable time was lost in attempting to find the bleeding point in this region, and after it was demonstrated that none was present, but that the blood escaped from above, the ascending colon was followed upward and the small intestines retracted to the left. As soon as this was done, there was a gush of black blood, apparently from the upper part of the vena cava, which exceeded in quantity and rapidity of outward flow anything which I have ever seen in my surgical experience. The patient was quickly exsanguinated, and was kept alive only by the most energetic stimulation by intravenous infusion, the hypodermic use of whiskey and strychnine, and an enema of hot coffee. The hæmorrhage was temporarily arrested by gauze packing, and after a more thorough examination the vena cava was found to be intact, and the source of the hæmorrhage was an enormous rent in the right lobe of the liver, along its falciform and right coronary ligaments, which allowed the greater portion of the right lobe to hang downward, as on a hinge. This was hastily packed, the abdomen cleansed, and united with interrupted silk-worm-gut sutures.

The hæmorrhage was completely arrested by the packing and

upward pressure of the right lobe, but the patient never rallied, and died within twenty-four hours.

This case is an excellent example of a class of which the writer has seen several examples, where the symptoms and signs gave no adequate idea of the extent of the injury. Were it not for the presence of well-marked muscular rigidity, the patient would in all probability have been treated by the expectant method.

CASE III.—This is a case of rupture of the spleen with fairly typical symptoms.

G. B., an Italian, eighteen years of age, was injured by falling from a trolley-car, striking the lower left portion of the thorax and adjacent abdominal wall against an elevated railway post. He experienced severe pain in the region of the spleen and felt weak. He was brought to the hospital in an ambulance. On admission he looked pale; the pulse was rapid and weak; the breathing was shallow, and there was general abdominal tenderness and rigidity of the muscles. As the condition seemed to improve somewhat after the patient had been placed in bed, the attention of the writer was not called to the case until the following morning. At that time the patient presented the typical appearances of one having a severe visceral lesion, with hæmorrhage. There was marked pallor, the face was bathed in cold perspiration, the countenance was anxious, the ears were white and waxy in appearance, the extremities were cold. The patient was restless, thirsty, and suffered from air hunger. The pulse was rapid, varying from 110 to 130, weak, and compressible. The abdominal muscles were rigid. There was marked tenderness over the upper left quadrant.

No free fluid could with certainty be detected. He was immediately prepared for operation, and under ether anæsthesia an incision was made through the upper half of the left rectus muscle. On opening the peritoneum, a large amount of fluid blood escaped, which apparently came from the region of the spleen. This was with some difficulty drawn into the wound, and was found to be greatly enlarged (at least twelve inches in its long diameter). In the middle of the organ there was a transverse tear extending from the periphery nearly to the hilum. A mass of gauze was placed in the rent, and the lower end allowed to protrude through an incision just below the twelfth rib. The spleen was replaced, and the abdominal cavity thoroughly washed out with a large amount of sterile salt solution. Consider-

able reaction followed the operation. The temperature was elevated and the pulse extremely weak and small, and there developed a considerable distention of the abdomen. He was again infused, and had a number of rectal irrigations with hot saline and hypodermic stimulation. He vomited at intervals for two days, after which time there was a gradual improvement in all his symptoms. The temperature fell to the normal, the pulse improved in quality and diminished in frequency, the bowels moved, the abdominal distention subsided, and his condition seemed in every way satisfactory. At the end of a week there occurred a gradual rise in temperature, with headache, foul tongue, and apathy, but without leucocytosis. His wound was dressed and found to be in a satisfactory condition. There was no sign of peritonitis. His condition so strongly suggested typhoid fever, that a Widal test was made with positive result. It was then learned that at the time of his accident he was just recovering from an attack of typhoid fever, which accounted for his enlarged spleen, and also for his secondary rise in temperature, which we regarded as a relapse occasioned possibly by the traumatism. His symptoms gradually increased in severity, and he died during the second week.

CASE IV.—Another case of rupture of the spleen, but with atypical symptoms.

C. C., aged fourteen years, a school-boy, was thrown from his bicycle, striking a rock. The contusion occurred over the region of the lower ribs on the left side. He experienced some pain in the abdomen and vomited once, after which he felt relieved and walked home, a distance of over a mile. He went to bed, and the pain was relieved to some extent. The following morning he again had pain in the abdomen and walked to the hospital, a distance of two or three blocks from his home. On examination after his admission to the hospital, his pulse was found to be 116, temperature slightly above the normal, countenance pale, but no other evidences of shock. The abdomen was rigid and tenderness existed in the region of the umbilicus and somewhat to the left. There was no dulness in the flanks and no evidence of free gas in the peritoneal cavity. He was immediately prepared for operation, and, after starting an intravenous infusion, an incision was made through the upper part of the left rectus muscle. As soon as the peritoneal cavity was opened, free blood escaped in large

quantities. The incision was enlarged and the small intestines withdrawn from the cavity, which enabled us at once to locate the source of the hæmorrhage as a transverse tear through the middle of the spleen. As the condition of the patient was extremely critical in spite of an abundant infusion and the most vigorously hypodermic and rectal stimulation, a mass of gauze was hastily thrust into the rent, and the spleen replaced and pushed snugly against the diaphragm. The abdomen was quickly cleared of clots, washed out, and the wound partly united with silkworm-gut sutures, the end of the gauze packing being allowed to emerge through the upper angle of the wound.

During the next three or four days the patient was kept alive only by the most generous stimulation and repeated saline infusions. The gauze was subsequently removed through an incision in the flank, made under anæsthesia, and he made a good recovery. In this case, also, the symptoms and signs even after eighteen or twenty hours gave one no idea, or even a suggestion, of the extent or gravity of the injury. The diagnosis of visceral injury was made from the history and presence of tenderness and well-marked muscular rigidity.

CASE V.—A schoolboy, six years of age, while playing about a room, overturned a table, the edge of which struck him over the upper part of the abdomen. The blow caused considerable pain, and he complained of feeling very weak and faint. He was brought immediately to the hospital, and on admission his pulse was found to be 100 and the temperature slightly subnormal. There was pallor, cold extremities, perspiration, and the child appeared in a condition of moderate shock. On examination the abdomen was found to be rigid. Tenderness existed in the region of the umbilicus. No evidence of free fluid or gas in the peritoneal cavity. The diagnosis of rupture of the intestine was made by one of the house staff, and a median incision made extending from the ensiform to the umbilicus. As soon as the peritoneum was incised, free blood, gas, and intestinal contents escaped. The lesion was found to be a double rupture of the jejunum about six inches from the duodenojejunal flexure. The ruptures were entirely separated from each other, and each involved the entire circumference of the gut, leaving a segment four inches in length attached only to the mesentery. Considerable hæmorrhage had taken place from the wounded mesenteric vessels.

The unattached segment of gut was removed and the upper and lower openings of the jejunum united with a small Murphy button. The abdomen was cleaned and united. The child continued in a condition of profound shock for twenty-four hours, and died.

Although in this case the symptoms were fairly typical, the degree of shock was surprisingly slight when we consider the extent of the lesion.

CASE VI.—A man, thirty-eight years of age, was struck in the middle of the abdomen by a falling bale of paper. He experienced considerable pain at first, but soon recovered, and after his admission to the hospital he presented no evidences of shock. The pulse was between 60 and 70 and of good quality; there was slight tenderness over the epigastric and hypogastric regions, and an appreciable degree of muscular rigidity. No vomiting; no signs of free fluid or gas in the peritoneal cavity. A diagnosis of visceral injury was made and an immediate operation advised. This was indignantly refused, and the patient insisted that he felt perfectly well, and was suffering only from a slight bruise of the abdominal wall. During the following night the pain increased, and the patient became restless and feverish. The next morning he appeared seriously ill. The abdomen was distended and tympanic; the liver dulness was not entirely obscured. Tenderness and rigidity were everywhere present. There was flatness in both flanks, which disappeared on changing the position of the patient. The blood count showed 16,000 leucocytes.

Although it was recognized that the outlook was then well-nigh hopeless, at the patient's request the abdomen was opened under ether anæsthesia. As soon as the peritoneal cavity was entered, a large amount of gas and foul-smelling, cloudy fluid escaped, which was found to be a mixture of seropus and intestinal content. The intestines in the lower half of the abdomen and pelvis were injected and covered with a fibrinous exudate. A large perforation was found in the lower third, through which gas and fæcal matter were constantly escaping. Several other severely bruised and ecchymotic areas were found on various coils of the small intestine. The rupture was united with two rows of Lembert sutures, the peritoneal cavity thoroughly irrigated, and the wound closed with two cigarette drains,—one leading to the pelvis and one to the right flank. The patient was infused and

generously stimulated. He did exceedingly well for more than a week. The temperature and pulse fell to the normal; the distention and rigidity disappeared; the bowels moved, and the patient took plenty of fluid food. About the tenth day he began to complain of pain and to develop signs of a rapidly spreading peritonitis, and died two or three days later. On autopsy, the original perforation was found to be healed, but a second perforation had occurred at the site of one of the many contused areas seen at the time of the operation.

This patient would undoubtedly have recovered had it not been for the secondary perforation.

CASE VII.—A negro boy, four years of age, was admitted to the hospital in August last, a short time after a contusion of the left flank and abdomen caused by falling down a flight of stairs. There was comparatively little evidence of shock, so little, in fact, that the child fell asleep soon after the injury, and the parents did not consider the question of seeking medical advice until it was noticed that the boy passed bloody urine.

On examination there was found only a slight tenderness over the left lumbar region. There was no evidence of free fluid in the peritoneal cavity and no rigidity of the abdominal muscles. The child had not vomited, and made no complaint unless handled.

A diagnosis of severe contusion or rupture of the kidney was made, and the child immediately prepared for operation. Under chloroform anæsthesia an oblique lumbar incision was made exposing the kidney, which was found surrounded by a large mass of clotted and fluid blood and with a decidedly urinous odor.

When the kidney was exposed, a transverse fissure was found at the junction of the upper with the middle third of the organ. The fissure extended from the external border to the hilum, freely opening the pelvis. In fact, the upper segment was only attached to the lower portion of the kidney by a narrow pedicle. The parts were thoroughly disinfected with peroxide of hydrogen and salt solution, and the upper segment replaced against the lower and sutured with catgut. The external wound was united with drainage and the dressings applied.

The child reacted well from the operation. The hæmaturia ceased at the end of twenty-four hours, and recovery was uneventful.

CASE VIII.—A middle-aged man received a crushing injury

about the pelvis, and was brought to the hospital in the ambulance. When admitted he seemed in a condition of mild shock only, and complained of slight pain about the right hip, buttock, and lower part of the abdomen. Examination revealed at first only multiple contusions. Urine passed immediately after his admission was clear and normal in appearance. A little later he was catheterized, and a small amount of bloody urine was withdrawn. A careful re-examination revealed a fracture of the pelvis and slight rigidity of the lower portion of the right rectus muscle, and a distinct tumor occupying the right half of the pelvis. As the patient seemed to be passing rapidly into a condition of deeper shock, and as the pulse was becoming more rapid and weak, he was prepared for operation. After the administration of the anæsthetic, the catheter was again passed, and to our astonishment a considerable quantity of clear urine was once more obtained. We were wholly at a loss to account for the intermittent hæmaturia, but as his condition was rapidly becoming one of great gravity, and as there was an evident lesion of some kind on his urinary tract, an exploratory laparotomy was hastily performed. On opening the abdomen, an enormous retroperitoneal hæmatoma was found occupying the right half of the pelvic cavity and extending well up over the iliac muscle. On incising the parietal peritoneum, a vertical fracture of the right innominate bone was found just anterior to the sacro-iliac joint, a rupture of one or more of the larger branches of the internal iliac vein, and a complete transverse rupture of the right ureter. As soon as the peritoneum was incised and the clots turned out, the hæmorrhage was very profuse, and was controlled with great difficulty, owing to the deep position of the bleeding vessels and the difficulty in keeping the field clear. (The Trendelenburg posture was not employed.)

After the hæmorrhage was finally arrested, the ureter was anastomosed by the Van Hook method and the abdomen closed with drainage. The patient never rallied from the shock.

CASE IX.—Male, aged twenty-five years, was brought to the hospital in a state of severe shock after a crushing injury to the region of the pelvis by being rolled between a car and brick wall. He complained of great pain about the pelvis, which was accentuated by any movement of the trunk and legs; also a strong desire to urinate. On examination there was observed mobility and crepitus, easily appreciated whenever the iliac crests or other

portions of the pelvis were moved. Tenderness was well marked in the hypogastric region, and a semisolid tumor was appreciated just above the pubic symphysis.

On catheterization the bladder was found to contain only a very small amount of bloody fluid; previous spontaneous efforts at urination had been ineffectual.

The pulse was rapid and weak, the temperature subnormal, the patient was apathetic and could give no intelligent account of the accident. He was immediately prepared for operation. Under ether anæsthesia, an incision was made in the median line just below the umbilicus and the peritoneal cavity opened, for purposes of exploration. Through this incision it was easily demonstrated that there was no intraperitoneal rupture, but that there was an enormous hæmatoma of the prevesical space extending more to the right than to the left side. The abdominal wound was immediately closed and the prevesical space opened by an extension downward of the original incision. A large amount of clotted blood was found and removed, after which the hæmorrhage from the deeper portions of the wound was very free, which necessitated immediate packing and the administration of a large intravenous saline infusion and other stimulating measures.

As soon as hæmorrhage was controlled, further examination revealed a transverse fracture of the horizontal ramus of the pubis on the right side, one fragment of which was directed inward and lay within the cavity of the bladder, passing through a ragged tear in its anterior wall which extended well downward to the prostatic portion. The displaced fragment of bone was forced back into position and sutured to its fellow by heavy chromicized catgut, the tear in the anterior wall of the bladder was sutured with two or three layers of catgut, and a small opening for drainage made in the summit of the bladder. These procedures were extremely difficult to carry out, especially the suturing of the deeper portion of the bladder wound, and consumed considerable time. It was my original intention to establish perineal drainage, as there was evidence of injury to the deep urethra and triangular ligament, but before this could be done, the condition of the patient became so critical that the operation had to be abandoned, and we were obliged to hastily pack the wound and place the patient in bed. Several infusions were given and every known method of stimulating resorted to to save his

life. He remained in a condition of severe shock for many hours, and then slowly improved. The wound became badly infected in spite of constant irrigation and frequent dressings. Several days later he was again etherized and a perineal opening made into the urethra, through which the bladder was drained; another drainage tube was passed through the perineal wound upward through the triangular ligament above the prostate to drain the foul pre-vesical space. These tubes were left in place for several weeks, until the wound was clean and until the suprapubic bladder wound, which had sloughed extensively, was beginning to close. They were then removed and the perineal opening was allowed to heal. Sounds were passed to preserve the patency of the urethra.

The suprapubic opening, however, persisted, owing to its large extent, and as a result a condition of contraction of the bladder gradually developed. The urethra recontracted, and the passage of sounds became more and more difficult. A second external urethrotomy was performed, and the bladder drained for several weeks in the hope that the fistula would close. This was finally abandoned and the perineal wound allowed to heal.

Efforts were then made to dilate the bladder by injecting each day as much boric acid solution through a catheter as the bladder would hold, preventing egress of the fluid through the suprapubic wound by digital compression. By this means the bladder capacity was increased in thirty days from one and one-half ounces to five and one-half ounces. He was then discharged, and told to report once a week for sounds, in the hope that the suprapubic fistula would heal spontaneously.

During his absence from the hospital the bladder became badly infected, and he developed a pyelitis on the right side. Sudden plugging of the upper extremity of the ureter by a calculus caused an acute attack of pyonephrosis, which brought him back to the hospital. On admission his temperature was 104° F.; pulse, 130. He was suffering from a severe aching pain in the right flank, which was the seat of a large oval tumor.

Nephrotomy was immediately performed, and about twenty ounces of pus and an obstructing ureteral calculus removed.

Two months later a plastic operation was performed on the suprapubic opening, which narrowed it to the size of a darning-needle.

Later it closed, and with the exception of a contracted bladder the patient is in excellent health.

Visceral injuries of the types illustrated by the foregoing cases are for obvious reasons necessarily fatal unless promptly relieved by surgical measures.

In many of these cases the condition of shock, even after the occurrence of the severest lesions, is during the first few hours surprisingly slight, and one must not judge of the gravity of the injury by the degree of initial shock.

Pain, tenderness, and muscular rigidity are often the only symptoms during the first few hours after the receipt of the injury, and the occurrence of these three symptoms following an abdominal traumatism should be regarded as a positive indication for an exploratory laparotomy. To delay exploration for the occurrence of other more characteristic and localized symptoms is but to invite disaster, as the resistance of the individual after the receipt of the severe visceral injury diminishes with every hour of delay, and the only hope of his being able to withstand the added shock of a severe surgical operation is to inaugurate the treatment at the earliest possible moment.

Time will not permit a detailed consideration of the treatment in these injuries which has been somewhat outlined in the report of the cases.

The plan of treating extensive fractures of the spleen by pressure and packing with gauze, rather than by splenectomy, has already been brought to the attention of the Society, and is applicable also to the liver. The writer believes that it is equally as effective in arresting hæmorrhage; it is accompanied by less shock; it saves time, and preserves an important organ.

In these cases, perhaps more than in any other conditions, success will depend upon speed of operation, perfection of technique, and the ability to administer at any moment the most vigorous stimulation. It has been the writer's experience in several cases accompanied by severe intraperitoneal hæmorrhage, exhibiting comparatively slight evidences of shock, that as soon as the peritoneum was incised and the intra-abdominal pressure was relieved, the patient passed rapidly into a state of profound collapse.

In all of these cases an assistant should expose one of the

large veins of the arm and introduce a cannula as soon as the patient is under the influence of the anæsthetic, and be prepared to administer the saline infusion at the time the peritoneal cavity is opened.

The use of the Trendelenburg posture, enemata of hot coffee, and the hypodermic use of strychnine, atropine, and whiskey, should also be employed at an early period.

INTRAPERITONEAL RUPTURE OF THE BLADDER.

WITH REPORT OF TWO RECENT CASES OF RECOVERY AFTER SUTURE.

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PREVIOUS to 1883, when Mr. Walter Rivington¹ gave the Hunterian Lectures on this subject, it was the opinion of most men that intraperitoneal rupture of the bladder was fatal, whatever might be the treatment. Mr. Rivington spent much time in showing that no genuine case of intraperitoneal rupture had recovered up to that time, yet said that he did not absolutely despair of success in the future with the aid of aseptic surgery.

In 1883 McCormack operated successfully upon two cases, and in 1888 Dr. H. H. Grant⁹ published a case of intraperitoneal rupture of the bladder with suture,—the first successful case in America. This case has unfortunately been left out of all previous papers published on this subject. Walsham, in 1888² and 1895,³ published papers on the subject, and with the aid of Miles tabulated the cases up to these dates. It was in the 1895 paper that he recommended the injection of air into the bladder as a means of diagnosing intraperitoneal rupture of the bladder.

Kerr⁴ in 1893 tabulated cases, and in 1901 appeared an excellent paper by Dr. Samuel Alexander⁵ tabulating all the cases published by Walsham and Kerr, and including several omitted by these men.

In going over the cases again, I found four cases that were omitted by Dr. Alexander in his tables, and three that were published after his report. Two are published for the first time in this paper. Thus we have nine cases to add to Dr. Alexander's table, making a total of fifty-four cases of intraperitoneal rupture treated by suture.

In these fifty-four cases there were twenty-six deaths and twenty-eight recoveries, *i.e.*, a death-rate of 48 per cent. If, however, we divide the cases into two arbitrary periods, taking the last ten years as one period, and all cases published previous to that time as another, we have a very much more encouraging outlook. That is, in thirty-two cases published previous to 1893 there were but twelve recoveries, giving a death-rate of $63\frac{1}{2}$ per cent., while in twenty-two reported since 1892 there were fifteen recoveries, giving a death-rate of $27\frac{1}{2}$ per cent.

If we look for the cause of death in these cases, we find that it is generally peritonitis, shock, or hæmorrhage; but by far the most common cause is peritonitis. Of twenty-six deaths, seventeen were owing to peritonitis, and in four of these cases the peritonitis developed subsequent to the operation. That the element of time must play an important part in such a condition cannot be denied; yet there must be other factors which are more important, as shown by the following figures. Of the twelve recoveries in our first period,—that is, previous to 1893,—we find that the average duration of time between the accident and the operation was twenty-three and one-fourth hours; whereas in the second period the average time was twenty-seven and one-fourth hours. In the cases in which death resulted there was a lapse of thirty-three and one-third hours before operation in the early period, and thirty-one hours in the second period,—that is, after 1892. There were also in the second period two cases, one ⁶ operated upon ninety hours after injury and another ⁷ eighty-nine hours after injury, in both of which recovery followed.

We have then an improvement in the death-rate of 36 per cent. in the second period over the first, and yet the average interval between the injury and the operation has increased four hours instead of diminishing, as we should expect.

The improvement in the death-rate, *i.e.*, a diminution in the number of cases of peritonitis in the second period, is certainly not owing to earlier recognition of the cases, but rather, it seems to me, to an improvement in the technique of the operation and to the exercise of more care in methods em-

ployed in making a diagnosis, *i.e.*, catheterization and the injection test.

The cases of peritonitis may be divided into four classes: (1) Those in which the bladder is already infected at the time of the accident; (2) Those in which the bladder and the peritoneum are infected by catheterization or by injection tests; (3) Those in which the peritoneum is infected at the time of operation; (4) Those in which the peritoneum is infected by leakage of the urine after the operation.

(1) The first group of cases cannot be reduced to any great extent; such cases can be saved only by immediate operation, and only occasionally then. This group, though small, will always be a constant one, as a considerable proportion of cases of ruptured bladder occur in drunken men, and these men are the ones most liable to gonorrhœa and its sequelæ, among them infected bladder. These cases compose the class upon whom it is most necessary to operate immediately, and yet this can be seldom done because the patients must recover from the effects of their drink before they have sense enough to present themselves for examination.

(2) In the second group of cases it seems to me that we find the cause for another considerable number of peritoneal infections. Careless catheterization is so easy, and perfect asepsis in such cases so difficult, that catheterization should be one of the last instead of one of the first things to be done. The injection of boracic acid or salt solution is still more dangerous. The catheter is put into the bladder, pushing infected material in the urethra before it. This material—including bacteria from the inside of the catheter, if it has not been boiled—is washed into the abdomen through the opening in the bladder. When we consider that we have the basin, the solution, the syringe, the catheter both inside and out, and the urethra to sterilize before we can be sure that we are not introducing bacteria into the peritoneal cavity, it is easy to believe that the injection test is a dangerous procedure. Owing to the irritation caused by the urine, it takes very few bacteria to start a general peritonitis. Cases of this class are no doubt becoming

more infrequent, but there must still be room for improvement. A striking fact in connection with this subject is that, even with an increase of four hours in the interval between the injury and the operation in the second period over the first, we have peritonitis present at the time of the operation in 31 per cent. of the cases in the first period and in but 18 per cent. of the cases in the second period,—that is, since 1892. To what can this be owing but to more careful asepsis in the use of the catheter and of the injection test?

(3) Infection of the peritoneum at the time of operation has been decreased to a considerable extent by improvement in technique, but this is a contingency which may happen at any time, even in the hands of the most careful surgeons.

(4) Peritonitis owing to leakage is always going to be a danger, for, in spite of the greatest care in the suturing of wounds, occasionally one will leak. Walsham reported a case in 1888 in which leakage was due to giving way of catgut sutures. Careful suturing with silk through the peritoneal and the muscular coats only, with proper abdominal drainage, will reduce the death-rate in this class of cases.

The second most important cause of death is shock. Dr. Alexander reports three out of twenty-three deaths as due to this cause. The improvement in operative technique should diminish this death-rate somewhat; but many of these patients are alcoholics, who stand operations badly, and who are at the time of operation in a condition of considerable shock owing to injury and abdominal pain. In many reported cases the time spent on the operation is given as either two or three hours, which seems unnecessarily long, except in the most complicated cases. The time required for the entire operation should not exceed forty-five minutes.

Hæmorrhage is such a rare cause of death that it need not be considered here.

Pathology.—The theory that the peritoneum, which is not nearly so elastic as the muscular and mucous coats, gives way early and carries with it the muscular coat seems to be

exemplified in the case reported by Ewing,⁸ in which there was a rupture of the peritoneal and muscular coats without rupture of the mucous coat.

Technique.—There are some points in technique which seem worthy of mention. Dr. Alexander's suggestion of first opening the prevesical space is a good one, and will undoubtedly save opening the peritoneum in some cases.

The ease with which the suture of the bladder wound is accomplished depends largely upon the position of the patient. The incision should be made with the patient flat, after which the Trendelenburg position should be used and the intestines walled off with large gauzes. The fear of infecting the abdomen by this position is hardly worthy of consideration, unless the patient has been kept in the upright position from the moment of the accident and until every drop of urine has been gotten out of the abdomen. This, of course, is an impossibility.

Walsham speaks of the difficulty of suturing the lower end of the wound. This can be obviated largely by putting the patient in the Trendelenburg position, by leaving the ends of each successive suture long, and by beginning to suture at the upper end of the wound. By this means the wound is pulled up within easy reach, and each suture below can be placed without difficulty. A round, full-curved needle in a needle-holder with a long handle, which can be held with the fingers instead of the whole hand,—*i.e.*, an elongated hæmostatic with short powerful jaws,—makes the suture a comparatively easy one.

Suture material should be strong enough to hold a considerable strain for several days, and should be easy to handle. Fine twisted silk seems to be, on the whole, the most satisfactory material.

After the sutures are placed, many surgeons use the injection test for their line of sutures. This seems an unnecessary delay and an unnecessary strain upon the sutures. We suture intestines without any test of our line of sutures, and why should we delay here? Drainage of the abdomen is by far the

safer method, and gauze drainage is preferable to tubes. Gauze will not only effect a walling-off of the sutured region, but by adhering to the bladder wall will relieve the sutures of a great deal of strain during the first four or five days. If the gauze is not taken out too soon, the pulling will not injure the wound in any way. When we use drainage, we may not get such brilliant results as we should if we should close the abdomen at once; but is not the patient's life of more importance than a brilliant result? Alexander reported four cases of peritonitis due to leakage of the bladder wound.

The published cases do not help us on the question of drainage of the bladder, as all methods have been used, but none often enough to give us any definite results. The tendency has been, however, towards either catheterizing the patient or making him urinate at frequent intervals. Perineal drainage has few advocates at the present time. Dohrn thinks that there is less danger of infection if a sterilized catheter is put in for constant drainage than if the patient is catheterized at frequent intervals.

To the records of cases already published, I am able to add two new ones of recovery after suture which have come under my personal care. Their history is as follows:

CASE I.—The following is a brief history of the case as it was sent to me by Dr. N. C. King, of Campello, who had charge of the patient before operation.

A. B., aged twenty-seven years, while hurrying for a car on the evening of October 22, 1901, ran against a post. There was sudden severe pain in the pelvic region with an intense desire to urinate. He walked about 150 yards, boarded a car, and rode over a mile, then walked a quarter of a mile to his home, where he was seen three hours later by a physician. There was no severe shock or collapse. He vomited three or four times. Pulse and temperature were normal. He urinated three or four hours before the accident.

The patient was seen by Dr. N. C. King, October 23, at 1 P.M. Pulse, temperature, and respiration were then normal. The patient had not slept at all. He complained of pain in the region of the

bladder and on the right side as far as the lumbar region. There was some rigidity in the iliac region. Desire to urinate was still present, but he was unable to void any urine. Patient catheterized, about five ounces of bloody urine withdrawn, but with no relief. Diagnosis of ruptured bladder was made, with the supposition that it was extraperitoneal.

October 24, 8 A.M. Did not sleep at all during the night, although morphine, one-quarter grain, was given every five hours. Patient catheterized, about one quart of bloody urine withdrawn. No dulness could be detected at the sides of the bladder or over the bladder. Still had severe pain in the pelvic region and desire to urinate, with occasional vomiting.

October 24, 6 P.M. Catheterized patient and obtained four ounces of urine, somewhat bloody.

October 25, 8 A.M. Slept one or two hours with aid of morphine. Symptoms same, but no vomiting. Temperature, normal; pulse, 90. Appearance of face not so good. Takes no nourishment. Patient catheterized, five ounces of urine withdrawn.

October 25, 9 P.M. Obtained five or six ounces with catheter. Patient had to sit up in bed because of severe abdominal pain when lying down. When sitting up, dulness over bladder region, half-way to umbilicus. Pulse, 100; temperature, normal.

The patient was sent to the Brockton City Hospital, where I first saw him about noon, October 26. His temperature was normal, pulse 110, and very feeble. There was an ashen hue to the face, and the eyes were sunken, with dark lines under them. There was general abdominal tenderness and distention, but little rigidity. Marked tenderness over lower abdomen, which bulged as the patient sat propped up on pillows. The bulging area, which extended about half-way to the umbilicus and into both flanks, was flat on percussion. The patient would not lie down because of the increased pain in the recumbent position. A diagnosis of ruptured bladder was made at once and the patient etherized.

Operation.—An incision of four inches was made in the median line from the pubes upward. When the subperitoneal tissue was reached it was found to be infiltrated with urine, so the prevesical space was first examined, but no more infiltration was found here than above. The peritoneal cavity was then opened; the intestines were distended and very much congested, but were nowhere roughened, except one coil in the posterior

cul-de-sac. The cloudy, slightly bloody urine which filled the abdomen was sponged out of the pelvis, and the intestines were held back with gauze until the bladder could be examined. On the posterior wall of the bladder, exactly in the median line, was a vertical gaping wound between two and three inches long.

The patient was now put in the Trendelenburg position and the intestines were walled off with gauze. This gave a beautiful view of the posterior wall of the bladder. The rent was closed by two rows of interrupted Lembert sutures of silk, beginning at the top of the wound. The bladder was held up by the upper sutures while the next lower suture was placed. The first row included the muscular and submucous coats, and the second row included the peritoneum and the muscular and submucous coats. No injection test was tried. The patient was lowered and the abdominal cavity again wiped out and flushed with salt solution. A gauze wick was placed extending from the posterior cul-de-sac upward over the wound in the bladder and out through the abdominal wound, which was closed by through and through silk-worm-gut sutures.

The patient throughout the operation was in a very wretched condition, and while trying to vomit before he was fully etherized had scarcely strength enough to begin breathing again. Everything was done in the most rapid way possible. The time occupied by the operation was about twenty-five minutes.

A catheter was put into the bladder through the urethra for constant drainage, but, as the patient kept pulling it out, it was left out at the end of the first twenty-four hours, and he was catheterized every four hours for twenty-four hours longer. He was then allowed to urinate voluntarily every four hours.

The patient made a perfectly uneventful recovery,—the wick was out entirely at the end of a week. There was no leaking. In July, 1902, the patient was perfectly well.

CASE II.—A. C., aged twenty-six years, walked into the Carney Hospital, September 12, 1902, complaining of pain in the abdomen. He was admitted to the medical side, and during the afternoon I was asked to see him. He was then in a partially reclining position in bed; and complained of severe abdominal pain without remissions, constant desire to urinate, and constant nausea. He said that on the previous evening, at about ten o'clock, he had had a movement of the bowels and had urinated. He then went to bed, and soon had a severe pain across the lower part of

the abdomen, with nausea and a desire to urinate,—all of which persisted during the night.

The abdomen was generally tender, but very rigid only during palpation. The flanks were dull, and the right side, towards which the patient was turned somewhat, bulged slightly. The pulse was 100; temperature, 98° F. A catheter was introduced and about one drachm of bloody urine obtained.

The patient was then asked again as to his condition on the previous evening and as to any injury, but he said that he had told the truth and had sustained no injury of any kind.

The injection test was not tried because the diagnosis seemed fairly clear, and we think it an unnecessary risk in most cases.

Operation.—The patient was sent to the operating-room, etherized, and prepared for operation. An incision was first made in the median line over the bladder. The subperitoneal fat was infiltrated with blood in all directions, and the peritoneum was found to be bulging at the upper part of the wound. The abdomen was therefore opened and was found filled with bloody urine. As this escaped, the peritoneum over the posterior wall of the bladder was seen to be infiltrated with blood and torn. About two inches from the superior peritoneal fold was an opening into the bladder which looked like a punctured wound, but when straightened out was found to be about one and one-half inches in length. The peritoneum was torn for about an inch below and above the wound. The patient was now put in the Trendelenburg position, the intestines were walled off with gauze, and the wound in the bladder was closed by a row of Lembert sutures of silk through muscular and submucous coats, after which a second row was placed, including the peritoneal, muscular, and submucous coats. The ends of the upper sutures were left long until the one next lower was placed and tied, as in Case I. The patient was now lowered and the abdomen flushed with salt solution. A gauze wick was put into the pelvis extending up over the wound in the bladder. The abdominal wound was closed with silkworm-gut sutures through and through.

The time occupied by the entire operation was thirty-five minutes. The patient's pulse rose from 100 to 130 during that time.

A soft rubber catheter was put into the bladder through the urethra for constant drainage. During the second night, the patient, who was on the verge of delirium tremens, got out of

bed and walked down the corridor, after pulling out the catheter. After this the patient was allowed to urinate every four hours or oftener. The wound became infected deep in the pelvis, and on the seventh day the bladder wound began to leak a little. This was probably owing to the fact that the patient had been allowed to go eight hours without urinating. He left the hospital in four weeks perfectly well.

The principal symptoms in both cases were: (1) Sudden severe pain in the lower part of the abdomen which remained as a constant pain; (2) Constant desire to urinate, with inability to do so; (3) A preference for erect or partially erect position of the body rather than the recumbent; (4) General tenderness, but little or no rigidity. (The abdominal wall was so lax in both cases that it bulged with the pressure of the free fluid in the abdomen.) (5) A small quantity of bloody urine in the bladder; (6) Dulness in the flanks.

As an aid to diagnosis, I cannot recommend Walsham's method of injecting air into the bladder. His own description of the method as applied to his second case seems sufficient to condemn it. His patient suffered intense abdominal pain and became collapsed; the heart became turbulent and respiration labored. Is this not a good deal for a patient already suffering from more or less shock to bear?

The boracic test, as I have stated previously, I believe to be one of the causes of general peritonitis in these cases, and therefore I think it ought to be used only in cases in which it is a positive necessity, and then only when the patient is prepared for immediate operation.

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² Medico-Chirurgical Transactions, 1881, Vol. lxxi, p. 150.

³ Medico-Chirurgical Transactions, 1895, Vol. lxxviii, p. 275.

⁴ ANNALS OF SURGERY, 1893, Vol. xvii.

⁵ ANNALS OF SURGERY, August, 1901, p. 209.

⁶ British Medical Journal, 1901, Vol. ii, p. 1772.

⁷ Case I in the report.

⁸ New York Medical Record, 1895, Vol. xlvii, p. 282.

⁹ Journal of the American Medical Association, July 28, 1888.

TABLE OF CASES OF SUTURE OF INTRA-PERITONEAL RUPTURES OF THE BLADDER.
(Supplementary to Alexander's Table in the ANNALS OF SURGERY, August, 1901, p. 209.)

No.	Reference.	Surgeon.	Age.	Cause.	Date after Injury.	Condition of Peritoneum.	Size and Condition of Rent in Bladder.	Kind of Suture Employed.	Treatment of Peritoneum.	Incision in Peritoneum.	Catheter in Bladder.	Remarks.	Result.
1	Journal of American Medical Association, July 28, 1888.	Crant.	19	Run over by cart.	5 hours.	No peritonitis.	2½ inches long on posterior wall.	11 catenized silk Lembert sutures.	Washed out with Thiersch's solution; drained by rubber tube.	No.	Catheterized every 2 hours.	Sat up on fourteenth day.	Recovery.
2	ANNALS OF SURGERY, 1895, Vol. xxii, page 706.	Briddon.	48	Denies injury or drink.	3 days.	No peritonitis.	Oblique wound in posterior wall 1½ inches long.	9 catgut sutures.	Washed out with hot water; drained by glass tube.	No.	Yes.	.....	Died in 24 hours.
3	ANNALS OF SURGERY, 1895, Vol. xxii, page 706.	Briddon.	21	Run over while drunk.	8½ hours.	No peritonitis.	Vertical wound of 2 inches; edges ragged.	13 fine sutures.	Pelvis flushed; drained by glass tube.	Yes.	Through peritoneum.	.....	Died in 4 days.
4	ANNALS OF SURGERY, 1895, Vol. xxii, page 706.	Briddon.	19	(Ske of the fell on him.	17½ hours.	No peritonitis.	2½ inches long on posterior wall; ragged.	Silk sutures.	Flushed with hot water; drained.	No.	Suprapubic drainage.	.....	Died in 12 hours.
5	Deutsches Zeitschrift für Chirurgie, July, 1901, Vol. ix, Nos. 3 and 4.	Bohm.	41	Run over by wagon.	48 hours.	No peritonitis.	4 centimetres long, almost transverse; irregular edges.	Mucous and muscular coats with catgut; peritoneum with silk.	Drained with gauze.	No.	Nelson's catheter in bladder.	Left hospitalized in 3 weeks.	Recovery. 80
6	New York Medical Record, March 22, 1902.	Peder- sen.	42	Fell out of window while drunk.	9 hours.	No peritonitis.	Transverse rent just within the peritoneal field.	(Continuous suture of partially chromicized catgut.	Peritoneal cavity carefully wiped out; gauze drain.	Yes.	Through perineal wound.	Leaking on second day.	Recovery.
7	ANNALS OF SURGERY, October, 1902.	Blake.	34	.....	12 hours.	No peritonitis.	Rent of three inches posterior wall.	(Catgut sutures.	Flushed with salt solution and sponged out.	Yes.	Through perineal wound for 7 days.	No additional drainage.	Recovery.
8	.....	Jones.	27	Ran into post.	8½ hours.	Intestines dark red; one coil in posterior peritoneal sac ruptured.	2½ inches long in posterior wall; vertical edges thickened.	Lembert sutures of silk, two layers.	Flushed with hot salt solution; gauze drain.	No.	(Constant drainage for 6 hours, then voluntary micturition.	No leakage.	Recovery.
9	.....	Jones.	26	Refused to admit any injury or drink; emesis.	18 hours.	No peritonitis.	Wound high on posterior wall, 4½ inches long.	Lembert sutures of fine silk, in two layers.	Flushed with salt solution; gauze drain.	No.	Constant drainage for 48 hours.	Voluntary micturition after 48 hours; leaking on seventh day.	Recovery.

A CASE OF PANCREATIC CYST, WITH REMARKS ON THE PATHOLOGY AND SURGICAL TREATMENT.

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As the surgery of the pancreas is still young, the report of the following case of cyst of this organ may not be devoid of interest.

The patient, a young woman twenty-six years of age, was accidentally struck by a chair in the region of the stomach. At the time the injury was received the patient lost consciousness and was removed to her apartments. A stimulating treatment was prescribed by the physician summoned, and the patient shortly recovered, only to complain of more or less pain in the upper abdomen for several days.

Within a week from the time of the accident, the patient was able to travel, and continued to do so for about three months. During this time she occasionally complained of colicky pains in the abdomen, but in other respects appeared to be perfectly well. In July, 1900, that is to say about five months after the injury was received, she was suddenly awakened in the middle of the night by a sharp pain in the right hypochondriac region, which continued off and on for several days, and finally disappeared. During this attack there was no jaundice, and, as far as could be ascertained, the stools remained normal in color.

The patient remained quite well after this attack until the early part of September, when she was again suddenly stricken with very severe colicky pains in the region of the liver. This attack occurred during the night, but by morning her condition was improved. For the next fortnight the patient felt perfectly well, but again the pains appeared, although they were not quite so severe, and appeared to be rather more in the region of the stomach. On this occasion there was slight jaundice present, and the stools bordered on the clay color. The patient was beginning

to feel somewhat exhausted from these repeated attacks of pain, and began to suffer from vague digestive disturbances, more particularly a fulness in the stomach after eating, and the more or less distention of the bowels from gas, an hour and a half or two hours after eating.

The condition continued pretty much the same until another attack of colic occurred in the early part of October, and as gall-stones were suspected, the patient was advised to seek surgical advice.

Examination of the patient on October 6, 1900, revealed the following conditions: A tall, well-built, and fairly nourished woman, presenting a slight suggestion of jaundice. The skin and mucous membranes are rather dry. Tongue coated with a thick white fur. Temperature, normal; pulse, 82; respiration, 19. Examination of the thoracic contents was negative.

By inspection, the upper part of the abdominal walls seemed to bulge slightly forward, and it appeared that the hepatic region was fuller than the left hypochondrium. By palpation the region of the liver and the epigastrium was quite tender. Liver dulness extended from the mammary line to five fingers' breadth below the costal border, and extended horizontally backward through the middle line slightly below the umbilicus. The surface of the liver appeared to be somewhat irregular, while pressure under the margin of the organ provoked some pain, more particularly towards the epigastric region, at which point it became very sharp, and was at its maximum at a point midway between the xiphoid cartilage and the umbilicus.

From the tympany present by percussion, I was under the impression that the colon covered the liver and was probably adherent to it. It also seemed as if the contours of the stomach were more to the left than was to be expected normally. There was no apparent dilatation of the organ.

The lower half of the abdomen appeared normal, and bimanual examination of the genital organs was negative. Urine was normal, and at the time of the examination the stools were very light brown in color, and could only be obtained by the daily use of laxatives.

The result of this examination, as may be seen, left one in considerable uncertainty as to the true nature of the affection; but my impressison was that we were dealing with an enlarged

gall-bladder, and suggested an exploratory incision as the best course to be pursued.

Two days later the abdomen was opened in the median line from the tip of the sternum to the umbilicus. The stomach was found in its normal condition, protruding from under a normal liver and pushed forward by a cystic mass situated behind the viscus. By palpation the tumor appeared to be the size of a large grape fruit, and fluctuation was distinctly present. The gastro-colic ligament was torn through and the tumor exposed. It was more or less adherent to the surrounding structures. Careful examination showed that it would be imprudent to loosen the tumor by breaking down the adhesions, so I decided to stitch the upper pole of the cyst to the peritoneum of the anterior abdominal wall. This was accomplished with some little difficulty, but it was finally secured firmly in position by catgut sutures. The remaining part of the abdominal incision was then closed. The cyst wall was then incised, and about 700 or 800 centimetres of dirty greasy fluid, containing fat corpuscles in considerable amount, was evacuated. The interior of the cyst was then explored by the finger. As a whole, it felt more or less soft and even, although in some spots patches of granular-like tissue were found. A large glass drainage tube was then inserted and the cyst carefully packed with iodoform gauze.

Three hours after the operation I was hurriedly summoned by the nurse, who stated that a postoperative hæmorrhage had taken place, and on my arrival I found the abdominal dressings thoroughly soaked with dark blood. The dressings were removed as well as the drain and the iodoform gauze filling the cyst, and it was then found that a general venous oozing of considerable intensity was taking place from the lining membrane of the cyst. The cavity was freely irrigated with a hot salt solution, and was then carefully packed with gauze cravattes, which were saturated with a 10 per cent. solution of gelatin. This permanently controlled the bleeding.

For the first two weeks following the operation the cyst secreted a large amount of a dark yellow fluid containing small masses of necrotic fat, to such an extent that the dressings were changed several times a day; the opening showed no signs of granulation tissue until about the tenth day, and then it began to contract.

By the end of the third week following the operation the secretion began to diminish in quantity. It became thinner in consistency, while in color it bordered on a light yellow. The circumference of the opening gradually diminished, so that five months after the operation only a small fistulous tract remained, which was definitely closed in about five weeks by injections of chloride of zinc.

The patient was seen in August, 1902, and found to be in a perfect condition of health. The abdominal wound was perfect, there being no trace of hernia in the region of the fistula, and by palpation only a slight amount of thickening could be felt by deep pressure, which was painless to the patient.

The contributions to the pathology of pancreatic cysts have not been numerous, but I think we may safely divide these pathologic productions, as does Körte, into four groups. (1) Retention cysts of the excretory duct; (2) proliferation cysts of the pancreatic tissue (cystadenoma); (3) retention cysts originating from the glandular vesicles, and the smaller excretory ducts due to narrowing, which is the result of a chronic interstitial pancreatitis; (4) pseudocysts, which are cystic formations arising from inflammatory or traumatic lesions of the pancreas, and which give rise to retroperitoneal hæmorrhages or to a collection of blood in the bursa omentalis.

In the first group the retention cysts are either present in the form of ampullary dilatations of the entire principal excretory duct, and which may extend into the neighboring canals, or there may be circumscribed sacculated dilatations. A third type has been described by Klebs which originates in the smaller excretory ducts or even within the alveoli, and which he terms *acne pancreatica*. These formations are more often found in clusters in certain spots of the gland, the larger ones, which are often multilocular, being formed by the fusing together of the smaller cystic productions.

Formerly it was generally believed that all retention cysts were either formed by an obstruction of the excretory duct by certain pathologic concretions, by a cicatricial contraction which was the end result of a catarrhal swelling of the duodenal open-

ing of the duct, or to its obstruction by the presence of neoplasms, etc.

Recent investigations have demonstrated that there are certainly other etiological factors in the formation of these cysts, and our illustrious compatriot Senn was one of the first to forcibly oppose the older theories. His experiments on animals seem to have conclusively proven that after ligation of the duct of Wirsung no cystic formation arises, and, what is still more striking, there is scarcely any noticeable dilatation of the canal. That this dilatation only attains a moderate degree is explained by the fact that the pancreatic secretions are resorbed by the lymphatics and blood-vessels as soon as the pressure reaches a certain degree. The secretions form only for a short time, because the involved glandular parenchyma being separated from the rest of the organ is soon destroyed by fatty degeneration and proliferation of interstitial connective tissue.

Experimentally, the ligation of, or pathologically the obstruction of, the excretory duct is quite insufficient for the production of a retention cyst, and Heinricus has pointed out that the most important etiological factor in the production of pancreatic cysts is the prevention of absorption of the pancreatic juice by the admixture of non-absorbable pathologic substances, or by a diminished functional activity of the vessels whose work it is to accomplish absorption.

But, as a matter of fact, the large majority of retention cysts attain only a very small size, and are of more interest to the pathologist than to the practical surgeon, as they only exceptionally produce serious trouble, and are most always met with as surprises during a necropsy.

The second type of cyst—the so-called proliferation cyst—is in reality a neoformation, which can be compared to ovarian cysts and similar pathologic products. So far as I have been able to ascertain, only fifteen instances of cystadenomata have been recorded. Körte says that they were cystic productions covered by a cylindrical epithelium, which by its proliferation had formed partly glandular formations and partly polypoid

productions, which were covered with epithelium. Waldeyer says that a progressive neoformation of glandular spaces takes place in the walls of glandular cystomata, and which change into cysts containing a mucoserous fluid. By slow development the walls of the cysts become thin and finally give way, and thus the cysts merge into one another and increase in size. At a later period the growth of the cystic cavities continues to increase on account of the fluid and mucous or colloid degeneration of cells desquamated from the lining wall of the cyst. This is simply a secondary development in the pathological process. What characterizes a proliferating cystic formation is the slow growth and the complete absence of any inflammatory process which could give an impulse to the growth.

Beside the retention cysts above mentioned, others are found which apparently bear no relation to the excretory ducts. They are larger in size, and usually arise from the tail of the pancreas, their contents being in most instances a blood-tinged liquid. The fact that the contents has shown signs of the presence of blood was considered most important for the understanding of the origin of this type of cyst. Le Dentu and Friedreich affirm that cysts arising in the pancreatic tissue have hæmorrhage as a primary etiological factor. The latter mentioned authority states that most hæmorrhagic processes are due to a passive hyperæmia, which is frequently combined with a chronic interstitial inflammatory process present at the same time in the parenchyma of the pancreas, and produced by the same etiological conditions. The hæmorrhagic exudates infiltrate the proliferating interstitial tissue, and later on in the process cystic formations become evident. These apoplectic cysts must be distinguished both in their nature and origin from cysts containing blood, and which are produced by hæmorrhages taking place into the cavity of a pre-existing retention cyst.

The above pathology has been accepted until quite recently, until the writings of Tilger and Körte appeared. These authorities look upon the apoplectic genesis of pancreatic cysts in an entirely different manner; and the former authority puts

forth the view that these cysts are produced by an entirely different cause, and that the hæmorrhages are only secondary occurrences in the process, and occur directly within the cyst cavity.

Tilger appears to have proven quite conclusively from his own researches, and that of other authorities, that an interstitial pancreatitis is present; and he ascribes the chief rôle in the formation of these cysts to the chronic interstitial inflammation and the proliferation of connective tissue arising around the lobuli. The constriction of the smaller vesicles of the gland produces an obstruction of the secretion, and with the resulting degeneration of the epithelium microscopical cysts arise. The same authority believes that the larger cysts arise from the smaller ones on account of the digestive powers of the pancreatic juice, while Dickhoff believes that the larger cysts are formed from the contraction of the proliferating connective tissue, and the obstruction to the secretion which produces a disappearance of the septa dividing the cystic cavities.

Tilger supports his view from the fact that the peptonizing fibrin digestive ferment is absent, and consequently must have been used up. In reply to the objection that in cysts of long standing no enzymes are present, he opposes the results of the latest investigations which have proven the presence of active ferments in retention cysts of long standing. Why in some cases the ferments have a solvent action and in others none, is as yet an unsolved problem. Boellke thinks that Tilger is too absolute regarding the absence of the ferment and its destructive action. At the present time all that can be said is that in some cases the digestive fibrin ferment is wanting, while in others the emulsifying or starch digesting ferment is absent.

Chronic interstitial pancreatitis is the result of traumatic affections or various forms of irritation coming from the intestinal canal. Chronic catarrhal inflammation of the stomach, obstruction in the portal circulation, or of the duct of Wirsung from catarrhal inflammation or sediments, tumors, etc., are liable to produce an irritation of the pancreatic parenchyma which later on induces a proliferation of the connective tissue,

and finally cystic formation results, as has been above described. It is also quite possible that inflammatory lesions of the pancreas may be caused in just the same manner as when they arise from intestinal irritation by traumatism to the upper part of the abdomen, and, according to Tilger's theory, the development of connective tissue and stricture of the vesicles of the pancreatic parenchyma may also lead to cystic formation in the latter case.

If this etiological factor of the development of the pancreatic cysts is an infrequent one, there are nevertheless a number of cases reported in the literature which make such a supposition more than probable, but I will not deal with them at the present time.

Besides the above mentioned types, other cases have been reported in which a cyst has developed following a severe contusion of the upper part of the abdomen, such as in the case here detailed. They have usually been found to contain a blood-stained or a transparent thin mucus, and frequently pancreatic ferments have been shown to be present, demonstrating that there was a direct communication with the pancreatic tissue. It would seem, however, that these tumors, which were considered as pancreatic cysts, were not so in reality, and simply were the result of hæmorrhages which had arisen in the subperitoneal aspect in the posterior surface of the omentum or in the bursa omentalis itself, and sometimes really extended into the pancreatic parenchyma.

The formation of subperitoneal pseudocysts occurs after a contusion of the epigastrium; there results a collection of blood and pancreatic secretion between the gland and the peritoneum covering it. As the collection increases, it pushes the peritoneum forward and protrudes into the bursa omentalis. As a secondary event, the extravasation may rupture into the omentum, or, on the other hand, the peritoneum remains intact, and is finally pushed forward until it reaches the gastrocolic ligament. The cyst thus pushes itself more and more between the stomach and transverse colon, and finally reaches the anterior abdominal wall.

Now, if the contusion produces not only a rupture of the glandular parenchyma, but also of the visceral peritoneum, a hæmorrhage occurs into the bursa omentalis, and the result is that the hæmorrhagic fluid is mixed with the pancreatic juice, and there results a circumscribed peritonitis with adhesions in the foramen of Winslow, which obstructs the latter, and thus a cyst is formed between the stomach and the transverse colon.

Although these two types of pseudocysts show a great difference in their anatomical positions, it is often impossible after a time to differentiate one from the other and to discover the exact starting-point, because the adhesions with the neighboring structures are very extensive.

Pseudocysts are in most instances characterized by a rapid growth, which is easily explained if one takes into consideration their mode of formation.

It would be well to mention here that Fischer believes that pseudocysts of the pancreas are in many cases hæmorrhagic exudates arising between the folds of the transverse mesocolon, and only become connected with the pancreas secondarily. According to the position of the swelling, the tumor will either lie above or just posteriorly to the transverse colon; but I would point out that these cysts are to be strictly differentiated anatomically from true pancreatic cysts, although they give rise to the same clinical phenomena, and are dealt with in quite the same manner as in other cystic formations.

In truth, very little is known about the etiology of pancreatic cysts. We often get a history of trauma in the upper region of the abdomen, and we can undoubtedly accept this as the causative factor in exudations arising in the bursa omentalis, the so-called pseudocysts, which appear within a short delay after a traumatism has been received. Perchance, also, if Friedreich's theory be accepted, a true cyst of the pancreas may be occasionally produced by a traumatic hæmorrhage arising in the pancreatic parenchyma. Owing to the frequent exposure that males undergo to traumatism, the larger majority of the cases of traumatic pancreatic cysts has been found in men. In many instances a gastro-enteritis preceded the advent of the

tumor. The patients first complained of dyspepsia, colics, and vomiting; but it must be remembered that the cause and the results should not be confounded. A slowly developing cyst might very possibly give rise to disturbances of the circulation and of digestion.

In other cases the history of the disease has shown that the patients had suffered from some acute infectious malady, and it is well known that after acute infections chronic changes arise in glandular organs; and it is quite possible that certain pancreatic cysts may be etiologically related to the acute infections. In quite a number of instances no cause could be attributed to the development of the tumor, the patients having always been in good health; and Körte found that the majority of these cases occurred in the female, although he could give no good reason for this fact.

As far as the treatment of cysts of the pancreas is concerned, surgical interference is the only one. The operative methods are two in number, namely, incision and drainage, or total extirpation.

The choice of the position of the incision should be guided entirely by the location of the growth, but in most of the cases reported the abdomen was opened in the middle line, occasionally over the most prominent part of the swelling.

If, after separation of the gastrocolic ligament and the peritoneum covering the cyst, the growth is found to lie freely, or if the existing adhesions can be easily separated, and the growth pedunculated, total extirpation is naturally the proper course to pursue. If the contrary conditions exist, the only choice that is left to the surgeon is incision and drainage.

After the cyst has been freely exposed, it should be stitched either to the abdominal wall or to the peritoneum. It appears to me of very little importance whether or not part of the contents is removed by an aspirator, because, if the abdominal cavity is properly walled off by gauze, there is little fear that it will become contaminated should any of the fluid contents of the cyst escape while the sutures are being inserted.

It would appear more advisable to stitch the parietal peri-

toneum to the peritoneum covering the cyst, and then the walls of the cyst may or may not be sutured to the borders of the abdominal incision. When the cyst has been anchored, it should be incised, and then the borders of the incision may or may not be sutured to the skin. A large glass drainage tube should be inserted into the cyst and its cavity packed with gauze.

Some surgeons have done the operation in two sittings. In the first they stitched the cyst to the parietal peritoneum, and then partially closed the abdominal wound, the remainder of which was left open and packed with iodoform gauze. In a few days firm adhesions have been formed between the cyst and the abdominal wall, so that when the latter is incised the contents cannot escape within the abdomen.

As to the ultimate results of surgical treatment of these cysts very little has been as yet recorded. Naturally, in those cases where total extirpation of the growth has been possible, there is probably only very little chance that a recurrence of the affection may take place. Of course, it should be remembered that it is quite possible that another cyst may develop at a later date, and which might arise from portions of the gland which had undergone cystic degeneration, and naturally at the time of the operation these changes would be overlooked.

In cases treated by stitching the cyst to the abdominal walls and drainage, it would seem that there is a great possibility of recurrence; and it should also be borne in mind that interminable fistulæ may result, which often give rise to various complications. It should be considered as a very fortunate occurrence that a closure of the fistula was obtained in the case here reported; and it is to be hoped that it will remain closed, as it probably will, if one considers the length of time that has passed without it showing any evidence of opening.

In reported cases of incision and drainage, the progress of the recovery has usually been that the secretion from the cyst is first increased and then diminishes; a fistula then results, which contracts more and more until it finally closes up. But, as has been pointed out, the fistula will not always close; and

in one case reported by Gould a fistula was present three years after the operation, while in another recorded by Gravemann the cyst was discharging after the lapse of over a year after the operation, and showed no tendency to close at that time.

Regarding total extirpation of pancreatic cysts when the operation is feasible, it theoretically would seem a most radical operation, and liable to do away with all further trouble; but it should be remembered that the operation is not devoid of danger. Firstly, on account of the deep situation of the pancreas, the control of hæmorrhage is a most difficult matter; and, secondly, important organs may easily be damaged if great care be not taken. If complete extirpation is attempted, it is better to first dissect the tumor from the peritoneal covering and then to continue the dissection from the pancreas, and after the growth has been removed completely, and when all hæmorrhage has been controlled, the abdominal cavity may be closed.

If in attempting a total extirpation of the cyst the adhesions are found tougher than was at first supposed, or a severe hæmorrhage or oozing results, it would seem better practice to desist from the removal of the cyst and simply stitch it to the abdominal wall and drain.

THE QUESTION OF SURGICAL INTERVENTION IN CASES OF INJURIES TO THE SPINE.¹

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THERE has been much doubt in the minds of surgeons regarding the proper course to pursue in treating persons who have been so unfortunate as to have had fractures or dislocations of the vertebræ. The first formal operation to remove a depressed spinal arch was made in 1814 by the younger Cline. In writing of his operation Cline said, "The only reasonable objection to the operation of trephining the spine is that we cannot, previous to the operation, ascertain whether the spinal cord be simply compressed, or whether it be partially or entirely torn through, or whether the symptoms of compression result from effusion of blood in different situations, neither of which, indeed, can be ascertained after the vertebral canal has been opened, unless the sheath be rent." It seems somewhat remarkable that after the lapse of nearly one hundred years the same statement will about express the doctrine promulgated at the present time. Two conclusions are possible,—either the surgery of the spine has not advanced in proportion to the strides in other fields, or the knowledge relating to the spinal cord has not yet sufficiently developed to give the correct indications for treatment.

At the present time the opinions of surgeons are divided into three groups: First, those who advocate exploration in every case of injury to the spine in which symptoms on the part of the nervous system are present; second, those who advocate total abstinence from operative measures; and, third, those who occupy the middle position and advocate operation

¹ Read before the Academy of Medicine of Cincinnati, November 18, 1901.

only in selected cases. These three groups will include the names of the prominent surgeons of the world to-day and correctly express their opinions. It is not possible for all three of these opinions to be correct, but it by no means follows that any one of them is absolutely wrong.

Injuries to the spine, like traumatisms to the skull, derive their chief importance from the damage done the contained nervous structures. Were it not for these effects upon the nervous tissues, injuries to both the skull and spine might be classed among the more trivial accidents. We can, therefore, at the outset practically exclude the osseous structures from consideration, because it must indeed be very unusual to have so extensive an injury to the bony parts as to require surgical intervention for the correction of deformity or for any other condition connected directly with the bone. The question of intervention, then, depends very largely, if not entirely, upon the amount of injury done to the spinal cord and upon our ability to annul or correct the baneful effects of such injury.

In the present state of our knowledge of surgical therapeutics and of the reparative powers of nature, it may safely be assumed that surgery offers no hope of improvement in the cases in which a complete transverse destruction of the spinal cord has taken place. Weissman's dictum that "Nerve-cells once destroyed are never replaced" may be accepted as proved, although some observations, notably those of Worcester, seem to prove the contrary. Lewellyn Barker ("The Nervous System," p. 246) says, "Regeneration of severed nerve-fibres within the spinal cord and brain is unfortunately very much less complete than in the peripheral regions."

All records obtained from operations and necropsies indicate that a complete transverse destruction of the cord is followed by permanent paralysis. Sufficient regeneration of nervous tissue to carry on the functions of the spinal cord does not occur, and no method is at present known by which these functions may be restored. In all cases of injuries to the spine involving the cord, the first and all-important question must be, Does the case present symptoms which lead the surgeon to

believe that nervous impulses can still be transmitted, wholly or in part, through the damaged area of the cord? Every surgeon will admit that operation in cases of complete transverse destruction of the cord is not only unscientific, but must be absolutely useless. When such a condition can be diagnosed, operative measures should be tabooed, because operation can give no relief to the patient, while it may bring reproach upon surgery.

A necessary preliminary to the above question is, Can an accurate diagnosis of complete transverse destruction of the cord be made? As so much depends upon the answer to this question, it is advisable to consider it in some detail.

It may be assumed for all practical purposes that nervous symptoms may be the result of three possible conditions of the spinal cord,—concussion, compression, or destruction. A proper discrimination in the diagnosis of these conditions seems to be the key to the whole question, because, where the symptoms are due to concussion or compression, restoration of function is possible either through waiting or through surgical measures.

Concussion of the spinal cord is, like the similarly named condition of the brain, largely a speculative one. It is applied, in all probability, to those cases in which there is comparatively little or no actual injury to the nervous tissue of the cord; in other words, those conditions in which nature promptly restores the function. As these cases all recover without operation, there is no data from which one can ascertain the pathological condition. Assuming such a condition to actually exist, surgical intervention is not at all necessary, because these cases all recover unaided.

Compression may be due to either extravasated blood or direct pressure from bony fragments. When due to extravasated blood, the probability of spontaneous restitution of function is much better than when due to bony compression.

The records of the Cincinnati Hospital contain the notes of twenty-four necropsies on cases of spinal injuries. In but four is mention made of any considerable amount of blood

within the vertebral canal, and in all of these more serious lesions were present. Thorburn ("A Contribution to the Surgery of the Spinal Cord") records but three cases out of fifty-six detailed, in which any considerable hæmorrhage is noted. We may therefore assume that compression from extravasated blood is not a very frequent condition, or that its symptoms are very evanescent.

From the stand-point of prognosis much stress must be laid upon gradually increasing, slowly appearing nervous symptoms following a spinal injury. Theoretically, cases of compression due only to pressure of extravasated blood should not be subjected to operative measures, because absorption of the clot will be followed by restoration of function. Compression by bony fragments or fibrous tissue and destructive lesions alone remain to be considered.

The following case report is a beautiful illustration of the value of surgical intervention in cases of compression by bony fragments. It is more fully reported in the *Cincinnati Lancet-Clinic*, December 25, 1897.

CASE I.—L. S., aged thirty-six years, attempted to mount a moving train, June 19, 1897, but lost his balance and fell between the platform of the station and the trucks of the engine. The oil-box of the engine struck him in the back. His head was also injured. He became unconscious immediately. When examined at his home by two physicians, it was ascertained that he had sustained a fracture of the sternum at the junction of the manubrium and gladiolus; that he had some superficial scalp wounds, and that he was badly bruised about the junction of the dorsal and lumbar regions. A fracture existed at this point.

The statement received from his physicians was that complete motor paralysis of the lower extremities and rectal and vesical paralysis supervened immediately after the receipt of the injury. During the following two weeks he suffered from almost constant priapism. He was admitted to the Presbyterian Hospital on July 13, 1897.

The writer saw the case with Dr. S. E. Allen on July 14. The notes made at this time say, "There is swelling at the dorso-lumbar articulation due to the displacement of the first lumbar

vertebra to the right. Motion is absent below the hips. The patient cannot flex or extend the hip, knee, ankle, or toes. The abdominal muscles can be contracted at will. All movements of the upper extremities are unimpaired. He cannot turn in bed except when aided by his arms. By means of this aid he can turn promptly to either side. Turning to the right side causes pain in the dorso-lumbar articulation, but no pain is experienced when the patient turns towards the left. The gluteal muscles and all those in the leg below these are completely paralyzed so far as motor power is concerned. The senses of tact, pain, heat, and cold are present in all parts, and responses are quickly obtained. There is no tenderness on compression of the leg or thigh muscles. There is some defect in the muscle sense impressions in the toes. The rectal reflex is absent and there is incontinence of fæces. Micturition is not impaired. The jaw-jerk is absent, as is also the knee-jerk on both sides. Triceps and wrist-jerks are present. The epigastric, abdominal, and plantar reflexes are present. No bed-sores are present. There is marked atrophy of all the muscles of both legs and no faradic reaction."

Exploration revealed a fracture of the first lumbar vertebra, with twisting of the first and second lumbar vertebræ to the right side. Fragments of bone were found pressing upon the cord, particularly upon the left side. One fragment had been driven alongside the left side of the cord and was evidently compressing the nerve-roots. Fragments of bone were carefully removed from every point of impingement upon the nerve structures. The dura was not opened as the cord seemed to be sound.

The patient made a very rapid recovery and was able to walk home, November 18, 1897. He can at the present time walk without any limp or peculiarity sufficient to attract attention and is actively engaged in business.

Particular attention is directed to the fact that pressure sufficient to cause complete motor paralysis existed thirty-five days before its relief by operation, and yet motion of the toes and ankles began a week after operation and complete restoration of function ultimately occurred. It should also be noted that the injury in this case was the result of direct violence.

For the purpose of comparison, I desire at this point to introduce short histories of two other cases in which rhachiotomy was done without any relief of the symptoms.

CASE II.—This case was reported to the Ohio State Medical Society at Zanesville on May 17, 1894. The full report will be found in the *Transactions of the Ohio State Society* for 1894, on page 186. A short report of the case is here given.

The patient was a farmer, aged thirty-four years, American born. Was first seen by me September 19, 1893. Fourteen months previously the patient fell from a tree, a distance of about twenty feet. He struck between his shoulders, head foremost, and the body then twisted violently towards the right side. Consciousness was not lost, but an immediate paraplegia supervened. Within two days a bed-sore appeared over the sacrum, which persisted for eight months. Paralysis involved both the bladder and rectum. Pain and soreness from the immediate injury gradually passed away, leaving behind a motor and sensory paraplegia, incontinence of urine, and rectal incapacity. The reflexes were all present and exaggerated. The legs were not particularly atrophied, neither were they contracted. There was no reaction to either faradic or galvanic electricity. The general condition was excellent, he being well nourished and of good color. He was able by means of a bar to raise himself from his bed into a rolling-chair and then to propel himself with ease. The girdle sensation was not well defined, though there was a suggestion of one present. Examination of the back showed a projection over the region of the eighth and ninth dorsal vertebræ. The patient was advised to have the parts explored. At the same time he was informed that the probabilities were strong against his receiving any benefit from the operation.

The operation was made on September 28, 1893. It was found that the seventh dorsal vertebra had been displaced, being turned to the right. The eighth and ninth had probably been fractured, and the spinal cord had been caught between the dislocated seventh and fractured eighth, thus producing an apparent disorganization of the cord for the space of about one inch. The dura mater was adherent to the bony canal. These adhesions were separated and the dura opened, when it was found that the structures of the cord seemed to be absent from the pinched portion except for a very narrow strand of nervous tissue.

On November 3 he returned to his home, the paraplegia being unchanged. The urinary symptoms were about as before, but he declared that the bowels moved more easily and satisfactorily than at any time since the accident.

The injury in this case had occurred fourteen months previous to operation, but the symptoms had remained unchanged from the moment of the accident to the date of operation. Although the patient is still alive, the condition remains the same as it was when he left for his home.

CASE III.—*Fracture of the Cervical Spine; Motor and Sensory Paralysis; Rhachiotomy; Death.* (Reported in *Cincinnati Lancet-Clinic*, December 25, 1897.)

A. W., aged sixty-two years, laborer, married. Patient was an old alcoholic, otherwise history was negative. On September 19, 1897, while under the influence of liquor, the patient probably fell down stairs, or at least he was found at the bottom of some steps, he having no knowledge of how he got there. He was unconscious for a short time. Dr. W. E. Shaw saw the case at the home of the patient. I saw the case with Dr. Shaw on the 20th, and found the following conditions present: Patient conscious and mental condition bright. Pulse was fairly good in volume but slow, being about 56. Respirations were rather stertorous. Temperature was subnormal. There was complete motor and sensory paralysis from the third rib down on the right side. On the left side the paralysis was complete in the arm as well as in the parts below. On the right side there was paralysis of the extensor muscles, the patient being able to flex the arm, but not being able to straighten it out after it was flexed. The pupils were contracted. There were no open wounds at any place. The bladder and rectum were paralyzed. The sense of heat and cold was abolished, as was also the muscular sense. Superficial reflexes were not present. Respiration was largely diaphragmatic. The patient was able to turn his head from side to side, and did not complain of pain when this was done. Examination of the head showed nothing abnormal. Examination of the neck posteriorly showed an irregularity at about the location of the second and third cervical vertebræ. Dr. Shaw had previously obtained crepitus at this point, so I made no attempt to elicit it. Diagnosis of fracture of one or more cervical vertebræ was easily made. The patient was sent to the Cincinnati Hospital, and entered my service in that institution.

On the following day, the 22d, the parts were explored under chloroform. Incision was made in the median line and the soft parts retracted. When this was done, fractures of the second

and third cervical vertebræ were made out. The loose pieces of bone were removed, the dura mater being laid bare. The dura mater was not opened, but the impression given by the sense of touch led us to believe that the cord at this level had been very largely disorganized. The patient rallied nicely from the operation, but when consciousness was regained the conditions were the same as previously recorded.

On the following day, the 23d, there was no change in his condition.

On the 26th it was noticed that a bed-sore was beginning over the sacrum. There had been a contusion of this part at the time of his accident. His mental condition remained good. The wound healed by first intention, but throughout there remained the conditions of paralysis above noted. The pupils remained contracted throughout the course of the case. Extensor paralysis of the right arm remained, also complete paralysis of the left arm and of all the parts below. The breathing became more and more diaphragmatic, and the patient gradually declined. Marked atrophy of the muscles was present and advanced rapidly.

He died on the 11th of October. Autopsy was not obtained because of a misunderstanding on the part of one of the officials.

From the stand-point of surgery, the question of intervention must be determined by the symptoms presented in each individual case. One may probably say with exactness that when all of the functions of the spinal cord are abolished in the area below the seat of the injury, the patient should not be submitted to operation. This statement may be qualified somewhat by saying that if, after the lapse of several days, there are no indications of nervous activity in the affected parts, one may safely assume that surgical measures will be of no avail in rectifying the condition.

Dr. A. J. McCosh, in the *Journal of the American Medical Association* of August 31, 1901, says, "As yet we have not sufficient experience or knowledge to make any definite statement concerning the early symptoms which indicate complete destruction of the cord. We do know, however, that if certain symptoms be allowed to persist for days or weeks the case will be hopeless. It is our duty to make an attempt to remove these

symptoms and their cause before it is too late. It has been stated more than once that where there is complete loss of sensation, motion, and patellar reflexes in both lower extremities, the symptoms indicate a complete crush of the cord, and that the case is absolutely hopeless. This view, however, is not correct, as has been shown by more than one case where all these symptoms have been present, and yet where, after removal of fragments of bone, recovery has resulted."

He then gives a history of a case of fracture of the seventh dorsal vertebra in which there was complete loss of sensation and motion, and abolition of the tendon, cremasteric, and abdominal reflexes. Operation was done nine hours after the injury and the patient recovered. Four or five bony fragments were removed. The dura was lacerated and the cord contused. There were small hæmorrhages present also. Improvement began five days after the operation and continued.

The only objection that can be urged to this case is that sufficient time had not elapsed after the injury to determine the permanence of the symptoms, so that this case does not by any means disprove the complex of symptoms which are usually considered diagnostic of a complete destruction of the cord.

Every surgeon must agree with Dr. McCosh in the statement he makes regarding our inability to diagnose the condition of the cord from any one or from any group of symptoms. Yet we must, of necessity, consider a case exhibiting complete paralysis of motion and sensation, absence of muscular and thermal senses with rectal and urinary paralysis and complete abolition of reflexes both superficial and deep, one in which the spinal cord gives no evidence of activity, and, so long as this picture persists, not one for operation. In the first case reported in this paper operation was advised because of the existence of the senses of tact, pain, heat, and cold along with ordinary sensation. These symptoms undoubtedly proved that a portion at least of the spinal cord was capable of functioning. This being true, a complete transverse destruction could not have been present. The knee-jerks were absent in this case, and remained in abeyance for a considerable time after

operation. This seems to be at variance with the dictum of Bastian that "Permanent loss of reflexes indicates a complete transverse lesion of the cord."

Kausch (*Deutsche medicinische Wochenschrift*, March 14, 1901) reports a case in which laminectomy was done upon a young woman for a tuberculous affection of the vertebræ. The spinal cord was completely divided transversely at the sixth and the eighth dorsal vertebræ. The tendon reflexes and muscle tonus were at once completely abolished, but returned,—the former in twenty-four hours and the latter in forty-eight hours. These persisted afterwards unmodified. The patient lived five and a half months. It would seem, therefore, that we have not yet arrived at the point in spinal diagnosis where a complete transverse destruction can be accurately predicted. Nevertheless, it would seem to be a good plan for surgeons to avoid operation in those cases which present an entire absence of spinal function, and to operate in any case in which evidence of impulses being transmitted through the damaged portion can be secured.

Another important point is the time at which operation should be performed. The usual advice given is to operate as soon as possible because of the possibility of prolonged pressure producing irreparable injury to the spinal cord. It would seem, however, that this fear of pressure effect is not well grounded. It is probable in the vast majority of cases that the pressure, if sufficient to cause destruction of the cord, produced its effect primarily, and the secondary degenerations were the result of extension of the spinal condition rather than due to continuous pressure. Carl Lauenstein (*Centralblatt für Chirurgie*, No. 51, 1886) records a case in which an excellent result was obtained by operation, even though paraplegia, rectal and urinary symptoms and atrophic changes had been present, and in which the injury preceded the operation by five weeks. Dr. McCosh records a still more convincing case in the article above referred to. His case, No. 6, was an old fracture of the fourth cervical vertebra, in which paralysis had been present for eight months, and yet complete recovery occurred. In his account of the

operation he says, "The fourth lamina had evidently been fractured and exerted posteriorly considerable pressure on the cord. In addition to this a new layer of connective tissue, with a much thickened dura, was found." In the first case reported in this paper the spinal symptoms had remained unchanged for thirty-five days before operation was undertaken, and yet recovery was complete. S. H. Weeks (*Transactions of the American Surgical Association*, 1901) quotes a case reported by Huss in which perfect recovery followed operation done a month after injury. Paraplegia, paralysis of the rectum and bladder, and a bed-sore over the sacrum are given as the symptoms present during the month. M. Allen Starr (also quoted by Weeks) reported a case in which the cauda equina was compressed for a year. Recovery, except for anæsthesia, followed operation at the end of the year. Wyeth also reports a case of a man with a fractured second lumbar vertebra operated on two years after the injury. Great improvement followed the operation, said improvement beginning six hours after operation. It would seem probable, therefore, that the question of the time that elapses between the date of injury and operation is not so important as it has previously been considered. In other words, if the injury is not irreparable at the time of accident, it is unusual for bony or other pressure to cause permanent abolition of function. This pressure may be sufficient, however, to hold the functions of the cord in abeyance. Dr. Samuel Lloyd (*Journal of the American Medical Association*, April 20, 1901, p. 1117) says, "In my opinion, therefore, we should wait until this period of shock has passed, and until it is evident that there will be no spontaneous recovery complete enough to render life bearable. If, after this period has passed, the patient still continues to improve, no operative interference should be considered, but as soon as the symptoms begin to show retrograde phenomena or seem to have reached the end of improvement operation should be undertaken."

The question as to what constitutes the proper waiting period is an important one for several reasons. In the first place, a large number of patients suffering from injuries of the

spine have other serious and perhaps fatal injuries; and, second, quite a number of cases will show disturbances of the spinal functions to a marked degree, and yet within a comparatively few hours exhibit pronounced improvement. It may be accepted as a rule that early operation is indicated in those cases in which there is evidence of some active function in the spinal cord. In the other cases, those in which there is no such evidence, it is highly probable that nothing is lost by waiting two or three days.

I have had copies of the histories of all the cases of this injury treated in the Cincinnati Hospital prepared. The comparatively large number of cases renders their study of particular value in deciding the future of cases of this kind without surgical intervention. The total number of cases presenting fractures or dislocations of the vertebræ is fifty-seven. Of these fifty exhibited symptoms arising from injury of the spinal cord, while seven failed to exhibit any symptoms of nervous involvement. The cervical region was implicated in twenty-three cases, the dorsal in eighteen, the lumbar in ten, the dorsolumbar in two, while in four cases the location of the injury is not specified. There were thirty-nine deaths among the fifty-seven cases (68 per cent.). Of the twenty-three cases in which the injury was located in the cervical region, twenty-two died, and one left the hospital on the second day following the injury, and his further history is unknown. Ten of the cases of injury in the dorsal region died ($55\frac{5}{9}$ per cent.). Five were discharged as improved, and three, in which there were no nervous symptoms, were discharged well. Out of the ten cases of injury in the lumbar region six died, one was discharged improved, and in three the condition was unchanged at the time of discharge. The two cases of dorsolumbar injury show a record of one death (50 per cent.) and one recovery, in which case no nervous symptoms were present. Of the four cases in which the locality of the injury is not given two died (50 per cent.) and two left the hospital alive, but no record was made as to their condition. Deducting the seven cases in which no evidence of involvement of the spinal cord was pres-

ent, there were fifty cases exhibiting spinal cord symptoms. Of these forty-one died (82 per cent.), four left the hospital unchanged so far as the nervous symptoms were concerned, and five were discharged as improved, but no account is given to indicate the amount or nature of the improvement. By putting the very best construction upon these figures, one can say that only 10 per cent. of the cases presented any improvement so far as the nervous lesions were concerned.

Eight of the fifty cases were operated upon. Six of these patients died (75 per cent.), and in two the condition remained the same as it was previous to the operation. Of the eight cases operated upon, the cervical region was affected in four and all died; the dorsal in two, one died and one remained unchanged; the lumbar region in two cases, one died and one was unchanged. The mortality, then, of operative cases in the cervical region was 100 per cent. The mortality of dorsal cases was 50 per cent., and that of the lumbar cases 50 per cent. None of the cases were benefited by operative intervention. Of the cases not operated upon, nineteen were in the cervical region. Of these eighteen died and one left the house the second day after the injury. The dorsal region was affected in eleven cases, eight of whom died and three showed more or less improvement. The dorsolumbar region presented two cases, with one death and one patient unchanged. The lumbar region presented nine cases, five of whom died, three were marked unchanged, and one was marked improved. The mortality, then, of cervical cases unoperated upon was $94\frac{14}{19}$ per cent., the dorsal cases $72\frac{9}{11}$ per cent., the lumbar $55\frac{5}{9}$ per cent., and the dorsolumbar 50 per cent. Comparing the mortality of the operated and non-operated cases, we find that the ratio is nearly the same in the cervical region in the two classes, and would probably be just the same were it not for the fact that one case unoperated upon left the house within two days following the injury. The mortality in the dorsal region is considerably less in the cases operated upon. The lumbar region shows about an equal mortality (5 per cent. in favor of the operated cases). An important fact to be remembered in

the cases marked improved is that these are frequently so prolonged as to pass from under the care of one surgeon and house surgeon into the hands of others, and thus the points in the case may be lost sight of. In one case improvement is said to have taken place in a patient who resided in the hospital 481 days after the injury was received. In another, 153 days elapsed between the time of admission and date of discharge. Such prolonged residence in the hospital argues against substantial or decided improvement. In none of the fifty cases does the record show complete recovery from the nervous symptoms. Eight of the cases recovered from the injury, but the nervous symptoms persisted.

Thorburn ("Contribution to the Surgery of the Spinal Cord") gives a total of fifty-six cases operated upon, thirty-eight of whom died ($67\frac{6}{7}$ per cent.). Eighteen recovered from the osseous injury, but only two were classified as recovered from the spinal cord symptoms. Sixteen showed either none or but slight improvement.

Dr. Samuel Lloyd (*loc. cit.*) has the following tables in his article. They bear more particularly upon the question as to the time for operation, and are certainly very suggestive when carefully considered.

CERVICAL REGION.	Immediate Operation.	Later Operation.
Deaths	21	2
Recovery	0	2
Improved	2	1
Not improved	0	4
Subsequent death	4	3
	—	—
	27	12

DORSAL REGION.	Immediate Operation.	Later Operation.
Deaths	23	5
Recovery	4	10
Improved	9	18
Not improved	6	16
Subsequent death	7	16
	—	—
	49	65

LUMBAR REGION.		Immediate Operation.	Later Operation.
Deaths		4	4
Recovery		1	6
Improved		1	6
Not improved		0	4
Subsequent death		0	2
		—	—
		6	22

SACRAL REGION.		Immediate Operation.	Later Operation.
Deaths		0	0
Recovery		0	1
Improved		0	3
Not improved		0	0
Subsequent death		0	0
		—	—
		0	4

One can readily see that these figures cannot be accepted as an accurate gauge of the situation, for the reason that the mortality will necessarily be higher in those cases that are subjected to an immediate operation, because a considerable proportion of them will have no chance to recover from the injury. By delaying operation, this not inconsiderable proportion of deaths is eliminated. One must therefore accept the statement that those cases in which operation is delayed are those which necessarily stand the best chance of recovering. It also necessarily follows that the cases which live for any considerable time after injury are those in which the injuries are less severe. Consequently, they are those in which good results would be obtained with either an early or late operation. Dr. Lloyd's statistics are therefore open to considerable criticism. It is not fair to assume that they did better because of the waiting. We should, however, consider the fact that this method is to be commended, because it removes the opprobrium of failure from a considerable proportion of cases in which failure was inevitable.

POST-TYPHOIDAL INFECTION OF RIBS.¹

BY J. SHELTON HORSLEY, M.D.,

OF EL PASO, TEXAS.

MR. C. B. M., Parral, Mexico, aged forty-two years, mining engineer, American. Family history negative, previous health excellent, except a severe attack of typhoid fever in the fall of 1900. A few weeks after convalescence had been fully established, pain and swelling occurred in the left side of the thorax, over the anterior end of the sixth rib and its costal cartilage. Pus formed and was evacuated by an incision. A sinus resulted, which a few months later was opened and curetted, but did not heal. He came under my care June 14, 1901. The patient was apparently very robust. There was a sinus opening at the centre of the sixth costal cartilage on the left side which discharged, in the course of twenty-four hours, about half an ounce of thick, tenacious, odorless pus. A probe would follow the costal cartilage to the sternum, and could be introduced for five centimetres in the other direction towards the rib, but no bare bone was detected. A rather imperfect examination of the pus showed a bacillus thought to be that of Eberth; no cocci or other bacteria were found.

Operation at St. Luke's Hospital, June 15, 1901, under chloroform. A twelve-centimetre incision was made over the sixth rib and cartilage, commencing at the sternum. All of the sixth costal cartilage was removed, most of the seventh, and part of the sternum. The perichondrium was curetted, care being taken to avoid injuring the internal mammary artery. The old sinus tract in the soft parts was cut away, the wound packed with iodoform gauze, and the skin partly approximated with silk-worm gut. He fully recovered from the immediate effects of operation. Temperature only reached 100° F. once. The wound, however, did not close, and patient left the hospital on July 14, with a sinus still discharging pus, though not so much as previous to operation. He was readmitted three weeks later, and operated on again under chloroform on August 11. A more extensive incision was made than at the previous operation, but in the same

¹ Read before the Southern Surgical and Gynæcological Association, November, 1902.

direction, following the line of the sixth costal cartilage and rib. Some cartilage had reformed, and this, together with all of the seventh costal cartilage and adjoining portion of the sternum as far as the middle line, was removed. Then five centimetres of the sixth rib were resected, though apparently only one centimetre was diseased. As the pleura was not diseased or thickened at this point and would bulge out at each expiration, care was required to avoid injuring it. Wound was treated as after the former operation. He suffered a great deal from pleurisy for five days, and was not completely relieved by strapping the chest. Otherwise convalescence was uneventful. Patient left the hospital September 1 with a sinus discharging a small amount of seropus. Healing, though slow, was uninterrupted, and on October 10, 1901, the sinus closed. There has been no tendency to recurrence, and when last heard from (September, 1902) he was perfectly well.

Diseases of bones following typhoid fever are interesting from several stand-points, particularly from that of time of occurrence. Post-typhoid osseous lesions may arise at any time, either during the attack of fever or from a few weeks to months, or even years, after convalescence from the fever. This is due to the peculiar vitality of the bacillus of Eberth. Schiller (*Arbeit. kaiserlich. Gesundheitsamte*, Vol. v, p. 312) implanted the bacilli on silk threads, and found them alive and active from one to two years afterwards. He asserts that they can live on potato culture for two years. Within the body their length of life is even more remarkable. Von Dungern (*Münch. med. Wochen.*, 1897, No. 26, p. 699, Keen's "Surgical Complications and Sequels of Typhoid Fever," p. 250) reports an instance in the case of a woman, aged forty, who was ill from typhoid fever four weeks in November, 1882. After a number of attacks of various kinds, such as gastralgia, periostitis of the lower jaw, etc., a tumor formed in the region of the gall-bladder in October, 1896. This was accompanied by pain and occasional chills. By February, 1897, the tumor had enlarged to the size of a child's head and was opened, 150 cubic centimetres of pus being evacuated. Careful examination showed the presence of typhoid bacilli in pure culture. Buschke ("Lebensdauer d. Typhusbacillen in ostitischen," Herden

Fortschritte d. Med., 1894, p. 573; Keen's "Surgical Complications of Typhoid," p. 20) reports the case of a woman of sixty-six who had typhoid fever in 1886. Without any evidence of another attack, a swelling in the axilla was incised February, 1894, and pus containing a pure culture of typhoid bacilli evacuated.

Another remarkable fact is the length of time discharge from an open sinus due to diseased bone will show a pure culture of typhoid bacilli. G. Sultan records a case in which a sinus existed for six years, after which time the pus showed a pure culture of the bacillus of Eberth (Case No. 15 in table).

It was at first supposed that the infection was always mixed with the staphylococcus pyogenes, eventually showing pure culture of typhoid owing to the great vitality of the bacillus. The bacillus of typhoid fever is now admitted to be pyogenic on occasions, and the experiments of Dehu, Vincent, Vaillard, and Dmochowski and Janowski (Keen's "Surgical Complications of Typhoid Fever," p. 113) demonstrate that the viability of the staphylococcus is even greater than that of the typhoid bacillus. Consequently, when a pure culture of the typhoid bacillus is found, it is unlikely that the staphylococcus pyogenes was ever present.

There are five peculiarities that appear to differentiate post-typhoid disease of the ribs from similar disease of other bones.

First. The marrow of the ribs seems to be a particularly favorite seat of the bacillus in a patient convalescing from typhoid. This fact indicates a lower resistance in the ribs than in other bones. A number of observers found the bacilli in bone marrow, where they remained for some time without producing disease. Quinke (*Berlin. klin. Wochen.*, 1894, No. 15), in nine post-mortems, found the bacillus eight times in the marrow of the ribs and once in the bones of the extremities.

Second. The position of the ribs being superficial, their movement in respiration practically continuous, and several being subjected to the constant impact of the heart's action, would make a locus minoris resistentiæ more liable to occur here than in other bones.

Third. Paget (*St. Bart. Hospital Report*, 1876) asserts

that, though there is, rarely, necrosis of the costal cartilages, necrosis of the ribs never occurs. Clinical reports do not bear out this assertion, but it is true that necrosis occurs less frequently in the ribs than in other bones,—a fact which tends to separate diseases of the ribs from similar affections of other bones where necrosis is more common.

Fourth. Post-typhoid disease of the ribs occurs very largely in later life. Keen ("Surgical Complications of Typhoid Fever," p. 137) says that of thirty-two cases in his table the age is given in eighteen: five were from twenty to thirty years of age; six from thirty to forty, and seven over forty. In a lecture before the German Society of Naturalists, Helferich (*Berl. klin. Wochen*, 1890, Vol. xxvii, p. 979), after asserting that the disease is the direct result of typhoid bacilli, says that it is mostly observed in advanced age (from thirty-one to sixty-three years in his series of eight cases), and thinks this peculiarity is due to changes in the costal cartilage from age, as vascularization, breaking of fibres in the intercellular substance, etc.

Fifth. The difficulty of thoroughness in operative treatment is most pronounced in the ribs. Unlike cases of osteomyelitis from empyema or pneumonia, the pleura is usually but slightly thickened, and is frequently normal. Consequently, it is very readily wounded. Even when it is not, there is liability to pleurisy, as occurred in the writer's case. The proximity of the pericardium, and, in the lower ribs, of the diaphragm, may also deter the operator from thorough work in these localities.

This difficulty is well illustrated by the fact that each of the two cases of post-typhoid disease of the ribs reported by Parsons (*Johns Hopkins Hospital Reports*, 1895, Vol. v, p. 417) as having been surgically treated at Johns Hopkins Hospital during the year immediately preceding his report had to be operated upon twice before a cure was effected. The case of Keen ("Surgical Complications of Typhoid Fever," p. 129) is also in point. The patient developed disease of the right sixth and seventh costal cartilages following typhoid fever. An incision was made which gradually closed, but the swelling

continued. About sixteen years later, in July, 1894, the tumor over the affected ribs was incised by Dr. Rice and part of one rib removed. The operation resulted in a sinus, which never closed. A second operation was done in October, 1894. In January, 1895, the wound having never healed, the patient was operated on at the Pennsylvania Hospital by Dr. T. G. Morton, who removed a portion of the sternum and parts of some ribs without a cure. February 20, 1895, Dr. Keen did an extensive flap operation, removing between three and four inches of the fifth, sixth, and seventh ribs, which were found softened from osteomyelitis. The wound healed entirely, but later reopened, and a sinus leading to the sternum resulted. March 25, 1896, Dr. Keen again operated, removing more diseased bone. Healing was very slow, but finally complete.

The symptoms and signs of disease of the ribs following typhoid fever are much the same as in disease from other causes, with the exceptions that the bacillus of typhoid is frequently found, and that the disease rarely, if ever affects the patient's constitution,—which latter fact is in great contrast to similar lesions produced by tuberculosis, pneumonia, or trauma. The temperature and pulse are not raised, though there may be free suppuration. In the case reported at the beginning of this paper, the patient's general health was not impaired, though disease of cartilages, rib, and sternum was quite extensive.

Post-typhoid lesions of the ribs and sternum must be more frequent than the number of fully reported cases seems to indicate. Helferich (*Berl. klin. Wochen.*, October 20, 1890, p. 979) states that he has seen eight cases in five years. Berg, a Scandinavian physician, has had seven cases in his own practice (*Ctbl. f. Chirurgie*, 1896, p. 153). Meacham (Paget's "Surgery of the Chest," 1896) saw four cases in the course of a single year's work. Though many reports, like Helferich's, Berg's, and Meacham's, are in such a fragmentary state that they cannot be used for tabulation, every effort has been put forth to make the following table contain all reported cases where sufficient data are given.

TABLE OF DISEASES OF THE RIBS FOLLOWING TYPHOID FEVER.

No. of Case.	Operator and Reference.	Sex and Age.	Ribs Affected.	Kind of Disease.	Time of Appearance.	Treatment and Remarks.
1	A. S. Grimm; Medical Record, New York, 1895, Vol. xlviii, p. 381.	Man.	Fifth, sixth, and seventh ribs; side not given.	Periostitis.	Pain and redness over sixth rib, in third week of fever; fluctuation about three months after recovery; pus evacuated and sinus resulted; (bacillus of Eberth found.)	Radical operation a year after abscess was lanced; sixth rib partly removed, fifth and seventh curetted; slow but complete recovery.
2	Richard Lampe; Deutsche Zeitschrift für Chirurgie, Leipzig, 1899, p. 603.	Young man.	Fifth, sixth, and seventh ribs and costal cartilages on left side.	Perichondritis and chondritis.	Was never free from pain in chest after fever; swelling appeared four months after recovery.	Resection of fifth, sixth, and seventh cartilages; perfect recovery; typhoid bacillus found.
3	J. C. Wilson; Medical and Surgical Reports, Philadelphia, 1891, Vol. lxiv, p. 733.	Man, 32 years.	Sixth rib, right side, at junction with cartilage.	Caries, chiefly of cartilage.	About a year after recovery from typhoid.	Operation refused; injection of methyl-violet every three or four days; cure.
4	S. O. Lewis Potter; Pacific Medical Journal, San Francisco, 1889, Vol. xxxii, p. 593.	Druggist.	Swelling over right side of sternum below left nipple, and one over third right rib, and over fifth, seventh, and eighth ribs.	Periostitis.	About four or five months after recovery from typhoid.	Swellings incised; only dark blood evacuated; iodide of iron and manganese given; improved but not cured.

5	Same reporter and reference.	Preacher.	A large swelling over ribs; no details.	Necrosis of ribs.	.....	Excision of diseased ribs performed twice without recovery; in both this and the preceding case large doses of antitubercin had been given during the attack of typhoid.
6	Same reporter and reference.	Man.	Left lower ribs.	Necrosis.	Soon after recovery from typhoid.	Operated upon several times with improvement but not cure; excision of diseased bone.
7	Reported by Albertine; operator, Maurice Pollosson; La Province médicale, Lyon, 1895, Vol. ix, p. 173.	Woman, 29 years.	Anterior extremity of seventh rib, right side.	Osteomyelitis.	Tumor appeared about two months after recovery from typhoid.	Incision and curettement; end of rib contained a cavity lined with fungoid granulations; cure.
8	Same reporter, operator, and reference.	Man, 35 years.	Anterior end of sixth rib, right side.	Osteomyelitis.	Pain commenced fifteen days after cessation of fever; about two months later an acute abscess formed and broke, leaving sinus.	Operation about three weeks after sinus formed; bone cavity in end of sixth rib curetted; sinus still remained.
9	Same reporter, operator, and reference.	Man, 56 years.	Sixth and seventh ribs, left side.	Osteomyelitis.	Had pain in sixth and seventh ribs during fever; about three months later an abscess formed and left a sinus which was operated on eighteen months later.	Curettement of anterior extremity of sixth rib, which contained a cavity; affection called "costal medullitis of typhoid nature;" wound was healing nicely when case was reported.

TABLE OF DISEASES OF THE RIBS FOLLOWING TYPHOID FEVER.—*Continued.*

No. of Case.	Operator and Reference.	Sex and Age.	Ribs Affected.	Kind of Disease.	Time of Appearance.	Treatment and Remarks.
10	Same reporter, operator, and reference.	Man, 42 years.	Fifth rib, right side, and adjoining portion of sternum.	Osteomyelitis.	One month after onset of fever pain was noted on right side of sternum; in ten days there was local swelling, and three months later an abscess formed and broke, leaving a sinus.	A cavity was found in sternum at insertion of fifth costal cartilage on right side; cured; complete cure.
11	Same reporter and reference; operator, Jaboulay.	Man, 40 years.	Sixth rib, right side.	Osteomyelitis.	Swelling appeared during convalescence; abscess formed and broke, leaving a sinus.	Operation about six months after inception of fever; curettement and removal of a portion of sixth rib; cure after long convalescence.
12	Same reporter and reference; operator, Terrier.	Man, 29 years.	Seventh and eighth ribs, left side, their costal cartilages and adjoining portion of sternum.	Osteomyelitis, with arthritis and necrosis.	Abscess formed during convalescence and was opened, leaving a sinus.	A small sequestrum found, corresponding to outer table of the bone; resection of three centimetres of seventh and ten centimetres of eighth ribs; rapid recovery.
13	Same reporter and reference; case of Vidal.	Woman, 24 years.	Swelling under right nipple.	Osteitis.	At beginning of convalescence.	Swelling persisted for four years, then formed an abscess and persisted as a sinus for five years longer, when three sequestra were expelled and the wound rapidly closed.

14	Same reporter and reference; operators, Achard and Broca.	Man, 27 years.	Left border of sternum; rib not mentioned.	Osteitis.	Tumor appeared during course of typhoid fever; three months later it was incised and pus evacuated.	Bacillus of Eberth found; recovery in one month.
15	G. Sultan; Deutsche med. Wochenschrift, August 23, 1894, Vol. 20, p. 675.	Woman, 35 years.	First and twelfth and clavicle, right side.	Osteomyelitis.	During convalescence two abscesses appeared, which were opened and formed sinuses.	Radical operation six years after typhoid; two sequestra removed and the diseased bone curetted; prompt recovery; bacillus of Eberth in clavicular lesion, the other not examined.
16	C. Achard and A. Broca; Gazette hebdomadaire de Méd. et de Chir., Paris, 1895, Vol. xxxii, p. 42.	Seaman, 26 years.	Left eighth costal cartilage.	Chondritis.	During convalescence a circumscribed tumor over eighth costal cartilage formed.	Operation a few weeks later; the tumor consisted of a mass of granulation tissue; two and one-half centimetres of left eighth costal cartilage were removed, including tumor; recovery; typhoid bacillus found.
17	Carl Caspersohn; Festschrift für Friedrich von Esmarch, 1893, p. 453.	Woman, 33 years.	Seventh and eighth ribs; also tibia, olecranon, and other places.	Osteitis.	.....	Tibial tumor operated upon, other got better; unguentum cinereum prescribed; probably cured.
18	Otto Barbacci; Lo Sperimentale, Florence, 1891, Vol. xlv, p. 365.	Man.	Right fifth rib, near sternum.	Periostitis.	During convalescence, before fever had entirely subsided, a swelling appeared over fifth rib.	Abscess was formed and was opened, and three or four centimetres of the fifth rib excised; result not stated; typhoid bacillus found in pus.
19	Engelisch; Wiener Med. Presse, 1867, p. 1204.	Man, 33 years.	Seventh and eighth ribs.	Periostitis.	About one and a half months after convalescence from typhoid.	Abscess formed and broke; no operation.

TABLE OF DISEASES OF THE RIBS FOLLOWING TYPHOID FEVER. — *Continued.*

No. of Case.	Operator and Reference.	Sex and Age.	Ribs Affected.	Kind of Disease.	Time of Appearance.	Treatment and Remarks.
20	Leon Ducloux; Des Complications Osseuses Provoquées par le Bacille d'Eberth, dans la fièvre typhoïde, Paris, 1895, p. 22.	Man, 22 years.	Sixth and seventh ribs.	Osteitis.	Immediately after convalescence.	Incision and curetting of wound; recovery.
21	Same reporter and reference.	Physician.	Tumor developed under right nipple.	Osteitis.	During convalescence from typhoid.	Incision evacuated a quantity of pus; recovery.
22	Buschke (case treated by Hellerich); Fortschritte der Medizin, Berlin, 1894, Vol. xii, p. 575.	Woman, 66 years.	Fifth and sixth ribs, right side.	Periostitis.	During convalescence from typhoid.	Incision and curetting wound and affected part of rib; cure; bacillus of Eberth found.
23	Paul Hoffman; Zur Casuistik der Knochenerkrankungen nach Typhus Abdominalis, Greifswald, 1888, p. 17.	Man, 61 years.	Fifth and sixth ribs, at junction with sternum, right side.	.....	Two and a half months after recovery from typhoid.	Excision of ends of affected ribs; recovery.
24	Same reporter and reference.	Man.	Right sixth rib.	.....	Three months after attack of typhoid.	Excision of the end of sixth rib; recovery.
25	C. Viannay; Archives provinciales de chirurgie, Paris, 1900, Vol. ix, p. 323.	Seaman, 26 years.	Left eighth rib.	Chondritis.	During convalescence from typhoid.	Excision of costal cartilage and end of rib; recovery.

26	Same reporter and reference.	Man, 36 years.	Right fifth costal cartilage.	Chondritis.	Shortly after recovery from typhoid.	Excision of two centimetres of cartilage; recovery.
27	F. Finney: Transactions Colorado State Medical Society, 1899, p. 246.	Woman, 35 years.	Left sixth rib, half inch from sternum.	Necrosis.	Three weeks after recovery from typhoid.	Necrosed bone scraped out; recovery.
28	Same operator and reference.	Man, 36 years.	Right sixth rib.	Necrosis.	About fourteen months after recovery from typhoid.	Necrosed bone scraped out; recovery.
29	Same reporter and reference.	Man, 55 years.	Sixth rib, sternal articulation.	Necrosis.	About three weeks after attack of typhoid.	Necrosed bone scraped out; operation only partially successful; second operation, result not mentioned.
30	A. Kuais: Les manifestations osseuses de la fièvre typhoïde, Paris, 1899, p. 31.	Man, 34 years.	Left first rib.	.....	Three weeks after attack of typhoid.	Excision of necrosed rib; recovery.
31	Ernst Kuster; Med. Chirurgie Central., Wein, 1882, Vol. xvii, p. 473.	Man, 46 years.	Fifth to eighth ribs, right side.	Perichondritis.	During convalescence from typhoid.	Excision of diseased cartilage and ends of ribs.
32	Jackson; British Medical Journal, 1885, Vol. i, p. 428.	Man, 42 years.	Left third rib.	Periostitis.	About four weeks after attack of fever.	Abscess broke, some necrosis of rib; spontaneous recovery after seven months.
33	Parsons; Johns Hopkins Hospital Report, 1895, Vol. v, p. 417.	Man, 35 years.	Left seventh costal cartilage.	.....	Pain during convalescence; a month later tumor appeared.	Tumor incised a month after its appearance; only blood evacuated, but sinus resulted; four months later curetting, which was unsuccessful; four weeks later excision of cartilage; cure after seven months; bacillus of Eberth found.

TABLE OF DISEASES OF THE RIBS FOLLOWING TYPHOID FEVER.—Continued.

Case No.	Operator and Reference.	Sex and Age.	Ribs Affected.	Kind of Disease.	Time of Appearance.	Treatment and Remarks.
34	Same reporter and reference.	Woman, 43 years.	Seventh, eighth, and ninth ribs, right side.	.....	Pain appeared four months after recovery; fifteen months later a tumor developed.	Excision of sinus and cartilage about a month after tumor appeared; sinus resulted; second operation of excision eleven weeks later; healed six months later; bacillus of Eberth found.
35	Same reporter and reference.	Man.	Left eighth rib.	Periostitis. (?)	Pain appeared during convalescence; two months later swelling with but little soreness; this subsided, and five months afterwards the swelling reappeared and subsided after six months, leaving a painless induration.	Guaiacol used locally during first swelling.
36	Valentini; Deutsche med. Wochenschrift, 1892, No. 22, p. 509.	.....	First rib. (?)	Perichondritis. (?)	Pain over ribs occurred day after typhoid temperature became normal, and in eight days there was a fluctuating tumor.	About ten cubic centimetres of pus showing Eberth's bacillus were evacuated by incision through pectoralis major.
37	Paget; Surgery of the Chest, 1896, p. 157.	Man, 40 years.	Left lower rib.	Periostitis and caries.	Some months after typhoid, first symptoms appeared; pus formed and was evacuated, leaving a sinus.	Curettement of diseased cavity was unsuccessful; resection of costal cartilage was followed after a long time by complete cure.
38	Keen's Surgical Complications and Sequels of Typhoid Fever, p. 128.	Man, 42 years.	Fifth, sixth, and seventh ribs, right side.	Osteomyelitis.	During convalescence.	Six operations before permanent cure was effected; typhoid bacilli not found.

39	Same reporter and reference, p. 133, case of Rice.	Eighth and ninth ribs, right side, and sternum.	.....	Three months after attack of typhoid.	Phosphates internally; incision and drainage; patient not cured.
40	Keen; Philadelphia Medical Journal, March 3, 1900, p. 508.	Fifth and sixth ribs on right side, and sixth and seventh on left side.	Osteomyelitis.	Pain developed during convalescence; two months later abscess appeared on both sides and broke, leaving sinuses.	Sinuses were open about ten months before radical operation was attempted, when typhoid bacilli were found in pure culture; after excision of diseased ribs and cartilage, wounds slowly healed, and nine months later were well.
41	Keen; Personal communication.	Third to sixth ribs on right side, at junction with sternum.	Typhoid abscess from periostitis.	.....	Incision showed most of the diseased ribs dissected from soft tissue by the abscess; cavity was scrubbed with gauze sponges, some infiltrated muscular tissue cut away, dusted with iodoform gauze; patient discharged from hospital two weeks after operation, with wound almost healed.
42	Bernays; Personal communication.	Sixth or seventh rib.	Periostitis and necrosis.	Symptoms began eight weeks after typhoid fever, and four weeks later abscess broke.	Excision of necrosed rib, two and a half inches long; wound packed with gauze and healed within three months; complete recovery.
43	Tinker; Philadelphia Medical Journal, March 3, 1900, Vol. v, p. 509.	Right ninth rib in middle axillary line.	Necrosis.	Soon after convalescence.	Incision and curettement; cure.

TABLE OF DISEASES OF THE RIBS FOLLOWING TYPHOID FEVER.—*Concluded.*

No. of Case.	Operator and Reference.	Sex and Age.	Ribs Affected.	Kind of Disease.	Time of Appearance.	Treatment and Remarks.
44	Schuster; Personal communication.	Priest, about 50 years.	Left lower, probably seventh or eighth rib.	.....	A few weeks after convalescence.	Patient has been operated on a number of times by different operators, but sinus still persists.
45	W. L. Brown; Personal communication.	Man, 69 years.	Third costal cartilage, right side.	Perichondritis.	Two weeks after convalescence.	A hard swelling which resolved.
46	Same reporter and reference.	Man, 35 years.	Anterior end of seventh rib and its costal cartilage.	Osteomyelitis.	Six weeks after convalescence.	Abscess formed and was opened, and diseased bone curetted; recovery.
47	J. F. McConnell; Personal communication.	Man, 41 years.	Left seventh rib.	Periostitis.	During convalescence.	A hard swelling first formed and disappeared, then reappeared and formed abscess and was incised; soon healed.
48	J. S. Horsley.	Man, 42 years.	Left sixth and seventh ribs.	Osteomyelitis and chondritis.	A few weeks after convalescence.	Abscess formed, was opened, and later curetted, leaving sinus, which required two radical operations, resecting diseased ribs and cartilage; complete cure.

ANALYSIS OF THE TABLE.

This table contains forty-eight cases. In twenty cases more than one rib was diseased. It is certain that there is a much larger number than this. Keen's "Surgical Complications and Sequels of Typhoid Fever," published in 1898, has a list of forty diseased ribs following typhoid; this table, compiled four years later, presents seventy-eight. Calling attention to this subject, as Keen's book did, served to stimulate the accuracy of observation and frequency of reports of such cases, for it is not possible that such a sudden increase of reported cases within four years can be due to any other cause.

Sex.—The sex is stated in forty-seven of the forty-eight cases. Forty are men and seven women. This is mostly owing to a much larger number of men having typhoid, but it would seem that the proportion in diseases of the ribs is unduly great. In woman the greater blood supply to the chest wall, on account of the mammæ, may explain this comparative immunity, as the resistance to infection would be thereby increased.

Age.—A peculiarity above alluded to is that post-typhoid diseases of the costal cartilages and of the ribs, according to the table, uniformly occur in adults. Of forty-eight cases the age is mentioned in thirty-eight. The youngest is a boy of nineteen (Case No. 42); the oldest sixty-nine (Case No. 45). Under twenty there is one case; between twenty and thirty there are eight; between thirty and forty, twelve; between forty and fifty, ten; between fifty and sixty, three; between sixty and seventy, three.

Locality.—In seven cases the ribs affected are not definitely mentioned. In the remaining forty-one they are as follows:

In the right side, the first rib was affected once; the third, three times; the fourth, once; the fifth, nine times; the sixth, eleven times; the seventh, four times; the eighth and ninth, each three times, and the twelfth, once.

On the left side, the first rib was affected once; the third, once; the fifth, once; the sixth, five times; the seventh, six times; the eighth, five times.

In cases in which the rib was mentioned, but not the side, the first rib was affected once; the fifth, twice; the sixth, three times; the seventh, five times; and the eighth, three times.

Two cases are reported in which ribs on both sides of the chest were diseased. Deducting these, there are thirty-six cases in which the side is mentioned, of which twenty-one are reported as on the right and fifteen on the left.

It would naturally be expected that, owing to the additional trauma of the heart's impulses, the left side would be the one most frequently diseased; such, however, is not the case.

In sixteen cases either the anterior end of the rib or the costal cartilage is reported as being the seat of disease.

Kind of Disease.—It is difficult to classify the kinds of disease, for one case may have several kinds, or one disease may be followed by another as a sequel. For instance, periostitis frequently results in osteomyelitis or osteitis. There are seven cases in the table in which the kind of disease is not reported. In the remaining number, osteomyelitis occurs eleven times; periostitis, eleven times; necrosis, eight times; osteitis, five times; caries, twice; chondritis, five times; perichondritis, four times.

These terms are often used loosely and inaccurately, but, making all allowance, it would seem that necrosis of the ribs does occur, despite Paget's assertion to the contrary. In Case 13, three sequestra were expelled; then the wound rapidly closed. In Case 15, two sequestra were removed, and prompt recovery followed. In Case 12, a small sequestrum was found.

Time of Appearance.—In classifying cases under this head where symptoms do not occur simultaneously, continuous pain in the region subsequently showing pathological changes, is taken as the date of onset, unless swelling is first noted. Frequently the pain would subside, and it would be months or years before the lesion developed, but the disease must have merely remained quiescent during this period.

It was found necessary to put in the classification the term "During convalescence." Cases under this head probably occurred during the first six weeks after the temperature from

the typhoid attack had become normal, yet the writer does not feel justified in so classifying them. In four cases the date of onset is either not mentioned or it is too indefinite to be classified. During the attack of typhoid fever, four cases occurred; during first two weeks after fever, one case; from two weeks to six weeks after fever, nine cases; from six weeks to six months after fever, two cases; from one year to three years, two cases; during convalescence, nineteen cases.

This illustrates the length of time in which the typhoid bacillus may be present and remain apparently inert.

Prognosis.—In general, it may be said that the prognosis as to permanent cure is not invariably good, though under intelligent and persistent treatment there is usually complete recovery.

Treatment and Results.—The treatment mentioned in the table includes everything from “masterly inactivity” to most extensive resections, and seems to depend largely upon the case. Some cases are so mild that they resolve and disappear under practically no treatment, while others may tax the ability of the surgeon to the utmost, and require repeated operations before a successful termination is achieved. In the obstinate cases, nothing short of most radical procedures, going some distance into apparently healthy bone, will accomplish a satisfactory result. For this reason a summary of different methods of treatment and their results would be misleading. For instance, two cases (Nos. 35 and 45) resolved, apparently requiring no local treatment; on the other hand, Case 38 required six operations, the last three being most radical ones, before a cure was effected. Case 44, after a number of operations by different surgeons, still has a sinus.

Of some interest in the matter of treatment is Case 3, where operation was refused, and a cure effected by injecting the sinus with methyl-violet solution every three or four days.

No definite rule can be laid down, but it would seem that, if resolution fails to occur, incision and curettage should be practised. If this procedure appears unsuccessful after a few weeks, the diseased ribs and cartilages should be extensively resected.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 12, 1902.

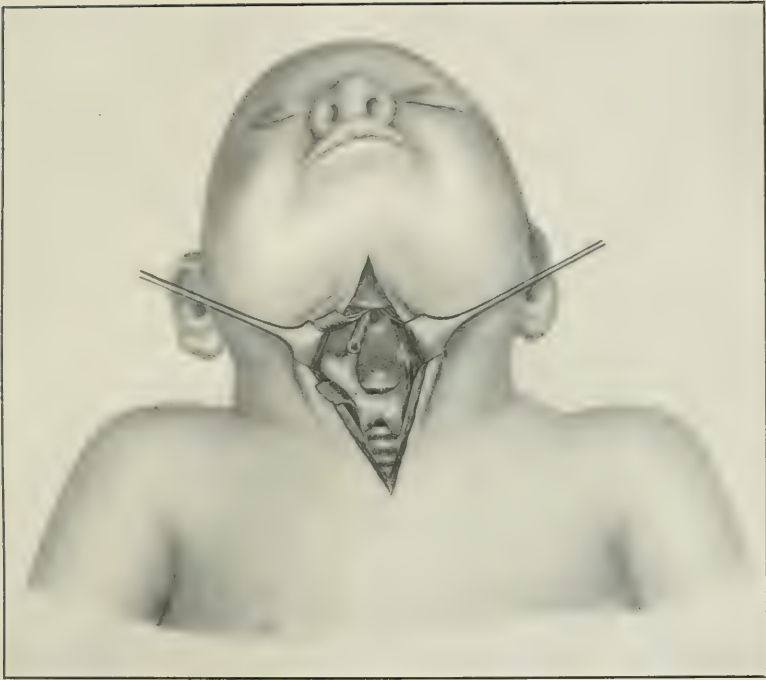
The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

PYLORECTOMY FOR CARCINOMA.

DR. CHARLES N. DOWD presented a man, fifty-one years old, who had suffered since boyhood with digestive disturbance, his principal symptoms being flatulence, pyrosis, and occasional vomiting. Last January, in addition to these symptoms, he began to lose flesh, and gradually became so weak that he was unable to do his usual work, suffering greatly from dyspnœa on very slight exertion.

July 29, when he came to the city, he was thin, anæmic, and weak. Palpation and auscultation revealed no disease of the internal organs. The stomach was not dilated, and no pyloric enlargement could be felt. Examination of stomach contents, however, showed absence of free hydrochloric acid after either Ewald's or Boas's test meals, and there was no lactic acid. Blood examination showed red blood-corpuscles, 2,408,000, in one cubic millimetre; leucocytes, 10,060, in one cubic millimetre; hæmoglobin, 60 per cent. of normal.

In view of the man's general condition and the absence of free hydrochloric acid in the stomach, an exploratory operation was done August 6. A nodule was found in the posterior wall of the pyloric end of the stomach, which was situated so high that the ribs had prevented its palpation. The growth projected into the stomach cavity from its posterior wall and obstructed the pylorus on account of its size. It did not infiltrate the circumference of the pylorus. Three or four of the neighboring lymph nodes were very slightly enlarged.



Persistent thyroglossal duct extending from the hyoid bone to the thyroid gland. It seemed to extend to the isthmus of the thyroid gland, but was so intimately blended with its right lobe that it could not be separated from it. The sinus discharged small amounts of mucopurulent fluid.

Pylorotomy was done. Clamps were placed at the cardiac side of the pylorus, but the portion of the stomach which was left in was not subjected to clamp pressure. Its margins were inverted, and stitched together with silk as they were cut; and a second row of similar stitches brought the peritoneal surfaces in firm apposition across the resected stomach edge. A silkworm-gut purse-string suture was then placed about the first portion of the duodenum, in which half of a Murphy button was placed as soon as it was severed from the pylorus. When this suture was tightened, the peritoneal edges of the duodenum came within one-quarter of an inch of each other, and were then brought together by silk stitches. The other half of the Murphy button was then inserted in the posterior stomach wall and union was made without particular difficulty, a row of silk stitches being used to increase the peritoneal apposition.

The patient made an uneventful recovery, and was able to take food by mouth after three days. Since the operation, he has gained about twenty-five pounds in weight. The button was passed on the twelfth day.

In connection with this case, Dr. Dowd showed the specimen, which was an adenocarcinoma.

PERSISTENT THYROGLOSSAL DUCT.

DR. DOWD presented a child which was brought to St. Mary's Hospital last spring. At that time it was two years old, and presented a nodule near the median line of the front of the neck, with a discharging sinus. On account of its location, it was not regarded as a lymph node, and upon cutting down upon it, it proved to be a rather unusual demonstration of a persistent thyroglossal duct. It could be distinctly traced up to the hyoid bone and down to the thyroid gland, into which it merged, so that the line of demarcation between it and the thyroid could not be distinguished. (See figure.) It was dissected out as completely as possible, and the child made an uneventful recovery.

A microscopical examination of the walls of the duct showed a combination of squamous, columnar, and ciliated epithelium. In some places the mucosa resembled that of the œsophagus, but continuous with this squamous epithelium, columnar ciliated epithelium was to be found arranged like that of the trachea; other sections were distinctly thyroidal in their structure.

In following down this duct, Dr. Dowd said, it led towards the right lobe of the thyroid instead of the left, as is usually the case, and further away from the median line than these ducts are ordinarily described to be.

ABSCESS OF THE LIVER OF TRAUMATIC ORIGIN.

DR. JOHN F. ERDMANN presented a man, forty-one years of age, who was seen by him on Friday, September 26, 1902. At this time he obtained the following history: Pain in the right lumbo-iliac region, with rigidity of the muscles, and temperature of 102° F., and pulse 120 on the date preceding his visit. He had been feeling badly for two or three days. Had vomited and had had chills. Upon examination, the upper half of the right rectus was found to be rigid; his temperature was 99.5° F. and pulse 100; marked tenderness in the appendicular and gall-bladder region. He was sent to the hospital and operated upon in two hours. Upon exposure of the peritoneal cavity, a quantity of brownish-red pus welled up into the incision. This was found to come from the lower border of the right lobe of the liver through a small perforation about the size of a goose-quill. This led to an abscess cavity in the lower border of the liver about the size of a lemon, which extended from the ventrad to the dorsad surfaces of the right lobe. A large sloughing area formed the periphery of the abscess cavity. The cavity was packed and the patient sent to bed. While the patient was lying upon the operating-table previous to taking the anæsthetic, he was seized with a sharp attack of pain that was so intense that it caused a profuse perspiration to break out all over his body. This pain was located by the patient about two inches above and to the right of the umbilicus. This evidently was the perforating of the abscess.

At a later date clearer and more definite history was obtained. He said that frequently during his work he would support large boxes, heavy weights, barrels, etc., by pressure against this region, and that possibly three or four weeks before his operation he had injured himself by coming sharply in contact with the pole of his truck, as the result of a fall produced by lifting one of these heavy weights, the force of the blow being received in the right hypochondriac region. He had always been healthy previous to this date, never had had any chill until a few days after the injury, and that he had then had chills, which he only described

as chilly sensation. That on the Sunday preceding my visit he had felt ill and had a slight sore sensation on the right side. That on the Wednesday following he had considerable pain, and that on the day following, or the day preceding the one on which Dr. Erdmann saw him, the pain was extremely severe in this region.

DR. BERN B. GALLAUDET recalled a similar case which came under his observation two years ago. The patient was a boy, five or six years old, who had always enjoyed perfect health. One day, while playing with his father, the latter's elbow accidentally struck him over the region of the liver. The blow was somewhat painful, and in the course of two weeks or so a swelling gradually developed over the liver, and with but slight symptoms of general infection. The boy was brought to the hospital, the abdomen was opened, and an abscess of the liver found. An examination of the pus showed simply a staphylococcus infection.

DR. F. KAMMERER said that in these cases of abscess of the liver of traumatic origin there is probably a hæmorrhage into the substance of the organ, with secondary infection. He did not think that the traumatism was the direct cause of the abscess.

EXCISION OF THE TONGUE FOR SARCOMA.

DR. ARTHUR L. FISK presented a man of seventy-one years of age, a farmer; he had not had either gonorrhœa or syphilis. Previous to ten years ago he was a great smoker, and had chewed tobacco to within two months. About ten months ago he bit the tip of the tongue on the right side; following this, the tongue was sore and very painful, and grew continuously larger. When he came under observation in the early part of September, the tongue was so large that he could not close his mouth; the right half was larger than the left. The tongue was fissured, but not ulcerated; the growths were beneath the mucous membrane in the muscles of the tongue, and were smooth and elastic. They were painful on palpation. There were no enlarged glands in the neck. The man was greatly emaciated, cachectic, and very weak. The pain was so intense that morphine had to be administered in constantly increasing doses, and only with the greatest difficulty could he take liquid food. On September 17, 1902, the tongue was excised, the lingual artery on the right side being first ligated in the neck. The stump of the tongue was drawn

well forward and stitched to the floor of the mouth, and the mucous membrane was brought together by fine catgut suture. The mouth was constantly cleansed with hydrogen dioxide. Convalescence was uninterrupted. Food was taken readily, and in large quantities, and the man steadily improved. The growth was examined by Dr. E. E. Smith, who reports, "Sections of the area of new growth reveal the structure of small round-cell sarcoma."

For three weeks the patient has been exposed to X-ray every fourth day for fifteen minutes. There is not the slightest evidence of any recurrence as yet, which is unusual, when it is considered that a palliative and not a radical operation was done.

BILATERAL COXA VARA.

DR. ROYAL WHITMAN presented a boy, thirteen years old, with a peculiar waddling gait which was due to a bilateral coxa vara. On account of the gait, the lordosis, and the great projection and elevation of the trochanters, the case might readily be mistaken for one of double congenital dislocation of the hip, especially as the mother insists that the child has always walked in this manner, although he has grown worse within the past two years.

Dr. Whitman called attention to the persistent adduction of the right limb, which caused an apparent shortening. He proposed to remedy the deformity by first stretching the contracted muscles, and then removing a cuneiform section of the shaft of the femur below the trochanter in order to restore the normal range of abduction.

SCLEROSIS OF THE BRAIN CORTEX.

DR. GEORGE WOOLSEY presented a woman, forty-six years old, who was admitted to the Presbyterian Hospital on October 14, 1901. Her family history was negative, and her previous history unimportant. Five years ago she fell down a flight of stairs; she did not lose consciousness, but was dazed, and sustained a laceration over the left zygoma and a bruise on the left side of the head, an inch and one-half above the left temporomaxillary joint. A month after the accident she noticed a slight tremor of the terminal phalanges of the first and second fingers of the right hand. This recurred in the form of seizures, and in subsequent attacks the region involved increased upward, until, at the end

of three years, the whole forearm was affected. At this time the patient first noticed a loss of sensation in the right hand, though during attacks all sensation is lost in the affected area. Subsequently, in these attacks, the tremor developed into a powerful twitching, and involved the arm, shoulder, right side of chest, neck, face, and tongue. For the last four months the power of speech has been lost during the attacks. The attacks lasted from one to fifteen minutes, beginning in the fingers and terminating in the lips. They occurred at irregular intervals, sometimes as many as fourteen in a single day, and again she would be entirely free from them for several months. They were gradually becoming more frequent and severe, and there was increasing loss of strength in the affected area.

An examination showed a marked increase of the tendon reflex in the right leg. There was a decrease of the reflexes in the right hand, both superficial and deep. The sensations to heat, cold, pain, and pressure in the right hand and arm were impaired, and there was marked loss of power. Astereognosis in the right hand.

The patient was kept under observation for some days in the hospital, and during this period the character of her attacks was carefully noted. The attacks were preceded by a sensation of intense burning, which was referred to the right arm; then there was twitching of the fingers, gradually extending to the arm and face, resulting in clonic spasm of the parts involved. During the attacks the head was turned to one side; there was no loss of consciousness. The attacks were typically Jacksonian in character, and a probable diagnosis of tumor, involving the cortex of the brain, was made. During this period an examination of the patient's eyes by Dr. Chas. Stedman Bull led him to believe that her symptoms were not due to the presence of a tumor, but were more indicative of syphilis.

Operation, October 19, 1901, by Dr. Woolsey. A quadri-lateral bone and skin-flap were removed over the centre of the motor area by means of an electric saw after openings had been made in the four angles by a burr. The dura was divided and the brain was found to be pulseless. In the motor area and beyond it, a marked change in its color was noticed; instead of the normal color, it was yellowish in appearance and firm in consistence. Two soft areas, however, were found; these were aspirated, and

a little serosanguineous fluid removed. The area of the brain, which was abnormal in color and consistency, was of considerable size, irregular in outline, and extended from behind the arm centre downward and forward over the motor area. Two small sections of this altered brain tissue were removed for microscopical examination, and the cut surface showed several small brownish-red spots, such as are often seen in a section of a glioma. The section of bone removed from the skull was not replaced, to afford relief for increase of intracranial pressure.

On the day after the operation, the patient complained of headache, otherwise no change in her condition was noticed. On October 22 there was increased power of extension of the right fingers. On the following day she was unable to speak, and the loss of tactile sensation had extended to the left side of the face. These symptoms were temporary, and were supposed to be due to pressure from oozing, which was quite free. On October 30 the stitches were removed. During this period the patient had a number of slight attacks of twitching, limited mostly to the thumb and index-finger of the right hand; she also complained of occasional pain in the right arm and shoulder. She was discharged, improved, on November 14, 1901.

The two sections removed from the cortex of the brain were submitted to the pathologist of the hospital, and proved to be a sclerosis, probably due to a syphilitic arteritis.

Dr. Woolsey said he saw this patient again about ten months after the operation, and learned that she had improved very much. After this she grew worse for a time and then again improved up to the present time. She still has attacks of twitching and pain, but they are less frequent and severe in character, and she has regained a good deal of power in her right arm and hand. There is still loss of the muscular and tactile senses. An interesting feature of this case was the marked and lasting improvement which followed the operation, though nothing was done except to relieve the pressure, while the continued administration of antisyphilitic treatment had given no result.

FIBROMA AND CYST OF THE BRAIN.

DR. WOOLSEY presented a boy of nineteen, who entered the Presbyterian Hospital, August 21, 1902. His family history was negative. He had never been addicted to the use of alcohol, and

gave no history of venereal disease. Five years ago he was struck on the left side of the head by a barrel, which fell about five feet. He received a scalp wound, but was not rendered unconscious by the blow. Three years ago, after retiring for the night, a sharp pain began in the left hand and crept up the arm to the shoulder. The pain was accompanied by twitching, which extended up to the left side of the face, and this gradually developed into a tonic spasm, and was followed by a loss of consciousness which lasted about half an hour. When he regained consciousness he felt well, and there was no resulting paralysis, stiffness, or pain. Two or three months later, while sitting in a chair, he had an exactly similar attack which lasted for fifteen minutes. A month later he had a third attack, and during or after this and the previous attack he limped on the left leg. After the first attack he had occasional seizures of slight pain and muscular spasm, once or twice in twenty-four hours, every day or two, which grew less after the last attack, and occurred for the last time about a year ago. During the course of his illness, there has been a gradual, progressive paralysis of the face, arm, hand, and leg of the left side. There are no distinct sensory disturbances.

Two months ago he had a severe headache, which improved and gradually disappeared after an attack of vomiting. It was at first general, but later became localized in both temporal regions. Similar headaches were complained of one and six weeks later. His chief complaints, when he was admitted to the hospital, were headache, weakness of the left leg and left side of face, and loss of function of the left arm. An examination showed some evidence of left facial paralysis. There was double optic neuritis. The pupils were equal, and reacted to light. The left upper extremity was almost completely paralyzed. The muscles were soft and flabby, but there was little wasting. The muscle and tendon reflexes were exaggerated. The left lower extremity showed loss of power; the muscle and tendon reflexes were exaggerated; ankle-clonus and Babinski's reflex were present. No abdominal reflexes were obtainable on the left side.

Operation.—On August 27, 1902, Dr. Woolsey removed a rectangular flap of scalp and bone over the motor area on the right side of the head. The bone flap was two and one-half by three inches in dimension, and was removed by means of the electric saw after openings had been made in the four angles by a burr.

Upon turning back the flap, it was observed that the dura did not pulsate. A flap of dura was then turned back, through which the brain protruded very markedly. The surface of the brain then began to split spontaneously, and through this fissure a bluish cyst wall could be seen; this ruptured spontaneously, and the fluid which it contained spurted fifteen to eighteen inches into the air. It was a fairly clear, straw-colored fluid, and about four or five ounces escaped.

Upon enlarging the opening in the brain, the cyst was found to measure about two by three inches in diameter, and to its inner wall an oval, hard, somewhat nodular tumor was attached; the latter was about an inch and one-half in length and an inch and one-quarter in width. The tumor was free on its outer side and in front, but internally and posteriorly it was quite firmly attached to the cyst wall. By pressure with the finger the attached portion was shelled off from the brain without much difficulty. The cyst was drained posteriorly, and the bone flap was replaced.

The same evening the patient could lift his left arm and move the hand, which he had been unable to do before the operation, and the following morning the movements of the arm were quite free. His facial paralysis had also disappeared. Astereognosis was noticed in the left hand. The discharge was profuse. His subsequent recovery was uneventful. On August 29 he had a severe headache and loss of motion of the left arm, which disappeared after the wound was dressed and a small collection of bloody fluid evacuated. On September 4 his condition was excellent; the wound still discharged profusely, but the muscular improvement steadily continued. He had good control over the muscles which were formerly paralyzed. Astereognosis disappearing. Babinski's reflex still present. On September 27 the movements of the parts were practically normal. The bone flap was firmly united to the skull. Only a small sinus, one inch deep, remained, which subsequently healed. His condition is now (November 12) normal, except that his left hand is not as strong as normal.

An examination of the brain tumor in the pathological laboratory showed that it was a fibroma, with appearances in parts which were somewhat suspicious of sarcoma. There were no glia cells. The question as to the nature of the cyst and the origin of the tumor is an interesting one. Judging from the speedy and com-

plete return of function, they did not result in destruction, but only in pressure and displacement of the brain.

DR. M. G. SCHLAPP, who, as neurologist, had examined both patients at the Presbyterian Hospital, said that, in the tumor case, the improvement following the operation was so marked that the question arose in his mind whether the cyst did not exist long before the tumor, possibly from some congenital cause, not, however, an embryonic diverticulum from the ventricle as may occur, because the tumor apparently grew from the wall of the cyst and was a fibroma. Hence, the cyst wall must have been of connective tissue and not lined by ependyma cells. The tumor growing from the wall of the cyst distended the cyst, not only by its own mass, but by causing the amount of fluid in the cyst to increase, which, producing pressure upon the surrounding tissue, caused a cessation of the function of the fibres mostly involved (arm), but when pressure had been relieved, the function to a great extent returned.

The location of the tumor (fibroma) was a very interesting one, being in the brain, surrounded on all sides by nervous tissue, from which a fibroma cannot develop. Hence it must have developed from the connective-tissue cyst wall, which probably took its origin from the perivascular connective tissue. Such cases are very rare. Prognosis in this case is probably good.

DR. GALLAUDET spoke of a somewhat similar case in which he had recently been called upon to operate. The patient was a man, fifty-five years old, who, eight months ago, suddenly had a generalized epileptic convulsion. Upon recovery from this he had two attacks of convulsions on the right side. Later there developed certain distinct areas of anæsthesia on the same side, especially of the face and upper extremity. Subsequently, he had two convulsions limited to the right upper extremity. Examination of the eyes was negative.

The patient was in Bellevue Hospital, under the observation of Drs. Norrie and Dana, and a probable diagnosis of tumor in or under the left Rolandic area was made. Two weeks ago, Dr. Gallaudet operated, removing a large, horseshoe flap of bone from the skull in the region indicated. When the dura was opened, the brain was apparently normal in appearance, with the exception that it was somewhat soft and collapsed, and a great deal of serum exuded. An aspirating needle was inserted in four different

places, downward, forward, and inward. The needle went in at least two inches, but nothing was discovered. On the day following the operation there was a loss of power in the right upper extremity, which still persists; it is spastic in character. The patient has also developed incontinence of urine and fæces. On the second day after the operation he had a temporary spasm of the right upper extremity and right side of the face. Re-examination by turning down the flap was negative.

ULCER OF THE STOMACH, WITH HOUR-GLASS CONTRACTION.

DR. JOSEPH A. BLAKE presented a woman, thirty-five years of age, who was admitted to Roosevelt Hospital on July 18, 1902. At the time she was nursing an infant twelve months old. Her family and previous history was negative, except that for several years she had had slight indigestion. She had not vomited until four months before admission, when vomiting commenced and was incessant; all her food, as she says, being vomited soon after eating. Vomiting persisted until her admission. She never vomited blood nor food that had been in her stomach for any length of time.

Two months before admission she began to have severe cramp-like pains in the epigastric region, accompanied with tenderness. In the four months there was a loss of twenty pounds in weight, and she became sallow. The bowels were constipated. No history of blood in the stools was obtained.

Upon admission she was emaciated, skin was dry and sallow. Her temperature was 99° F.; pulse, 92; respiration, 22.

The abdominal walls were flaccid. Two inches to the left of the median line and just below the costal arch a hard, irregular mass about two to three inches in diameter could be felt moving with the diaphragm. No dilatation of the stomach could be made out; but distending the stomach made the tumor more evident. Analysis of the gastric contents showed a marked increase in free hydrochloric acid and no organic acids.

Operation.—Nitrous oxide ether anæsthesia. Incision five inches long in linea alba above umbilicus. The stomach was found to be embedded in adhesions which bound it to the liver and pancreas, especially in the neighborhood of the cardia. Two inches from the cardia it was constricted and indurated, the con-

striction forming an isthmus two inches long, uniting a cardiac and pyloric division of the stomach, the latter being more than double the size of the former. On account of the adhesions, their exact disposition could not be made out until a tube had been passed and the stomach inflated. It was then found that they could not be opposed unless unwarrantable force was employed.

The pyloric division was then explored through an incision in its anterior wall, the finger being passed into the constriction, which admitted it easily. The lower wall of the constriction was covered with a soft tissue feeling like granulation tissue. No indurated ulcer was felt. The constriction was stretched until it would nearly admit two fingers.

Inasmuch as it was impossible to get at the cardiac division on account of the adhesions which had obliterated the lesser peritoneal sac, and therefore bound the stomach to the pancreas, and as the two divisions could not be approximated, gastro-enterostomy by Von Hacker's method was performed with the pyloric division, by means of Murphy's buttons, with the idea of improving the ulcer. Entero-enterostomy was also done. The anterior wound was used to introduce the stomach button, only the inner cylinder being passed through a short slit in the posterior wall of the stomach. The wound in the anterior wall of the stomach was then closed.

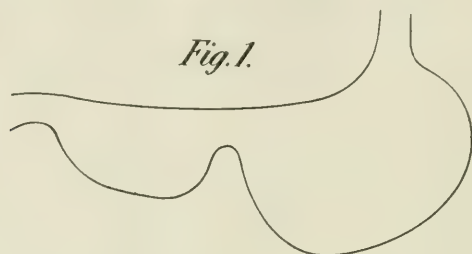
The subsequent results have been marvellous. The patient has not had a gastric symptom since the operation. She eats everything, and has gained thirty pounds in weight.

The explanation of this improvement may be that the gastro-enterostomy, by affording physiological rest and neutralizing the hyperacidity, has brought about the healing of the ulcer. The buttons have not been passed.

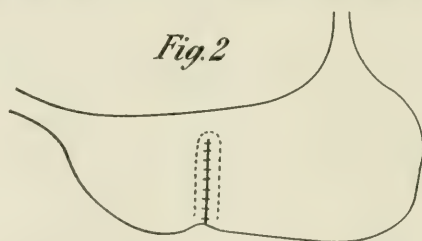
HOUR-GLASS CONTRACTION OF THE STOMACH.

DR. F. KAMMERER presented a man of forty-six years who had suffered for four years from symptoms referable to ulceration of the stomach; lately he had shown signs of pyloric obstruction. He has lost twenty pounds in weight during the last three years. On opening the abdomen under ether, a typical hour-glass contraction of the stomach presented itself. The larger part of the stomach was on the cardiac side, the capacity of this portion being about double that of the compartment on the pyloric side.

The stomach was adherent posteriorly at the point of contraction, and could not be raised from the abdominal cavity, although the dependent vertical portions could be nicely approximated. The contracted portion, it seemed, would not have admitted the index-finger. Beginning at the lowest point of the constriction, a running suture was applied through the serous and muscular coats, bringing the vertical edges of both compartments of the stomach



into close approximation along their posterior margins. An inverted U-shaped incision was now made through the entire thickness of the stomach-wall, about one-quarter of an inch to either side of the Lembert suture. The posterior wound edges were now brought together with another running suture from within; the same procedure being then applied to the anterior edges from without. The final act of the operation consisted in re-enforcing



the anterior suture with a running Lembert stitch and placing a few extra sutures at the lowest point of the stomach through the serous and muscular coats, where tension would naturally be greatest. When the stomach was first incised, a deep ulcer, just admitting the index-finger for about an inch, was discovered on the posterior wall of the stomach, immediately above the point of constriction, near the lesser curvature. This had evidently perforated all the coats of the stomach, but was enclosed within firm

adhesions. The latter had evidently prevented the delivery of the stomach upon the abdominal walls at the beginning of the operation. The patient made an uninterrupted recovery, and has gained twenty-two pounds in weight since the operation last June.

The principle of the method is practically the one demonstrated by Dr. Finney, of Baltimore, at the last meeting of the American Surgical Association.

PERFORATING TYPHOIDAL ULCERS, WITH GENERAL PERITONITIS.

DR. JOSEPH A. BLAKE presented a boy of sixteen years who was admitted to Roosevelt Hospital in the evening of August 24, 1902, unable to give a history of his illness except that he had been in bed for ten days, and that for three days he had had severe abdominal pain and vomiting. Afterwards it was found that he had been ill for ten days with the typical symptoms of a case of walking typhoid before he had taken to bed; and that three days before admission he had had a sudden attack of severe pain in the lower abdomen accompanied with swelling and tenderness.

When he entered the hospital, he was apathetic, the tongue was heavily coated. The respiration was superficial. The heart and lungs were normal. The abdomen was moderately distended; there was general rigidity and tenderness most marked in the right inguinal region. The spleen was palpable. There were no rose spots. There were no evidences of free gas or fluid. Leucocytes, 20,000; temperature, 102.2° F.; pulse, 140; respiration, 32.

With the absence of a definite history, a diagnosis of a spreading peritonitis from appendicitis or typhoid perforation was made, and operation was performed in less than an hour after admission, under general anæsthesia with nitrous oxide and ether. The incision was four inches long through the right rectus sheaths.

On opening the abdomen the peritoneal cavity was found full of pus, which extended throughout the greater cavity with the exception of the region immediately about the spleen. The pus from the right side of the abdomen and from around the liver was thick and white, while that from the left side was thinner.

The intestines were all markedly injected and distended, and those lying in the lower abdomen and pelvis were agglutinated together by a soft fibrinous exudate. The cavity of the pelvis was

full of pus and yellow fæces. The mesenteric glands were enormous and of a purple color; looking as if they were on the point of bursting.

The incision being directly over the appendix, it presented, and its extremity being embedded in a mass of lymph it was removed. The ileum was then drawn up in the wound, and three perforations were found in a segment lying between twelve and eighteen inches from the ileocolic junction. From two of these, which were each one-quarter of an inch in diameter, streams of thin yellow fæces were pouring, while the third was minute. The intestines were emptied in so far as was possible through the perforations, and they were then closed with purse-string sutures. The whole cavity was then thoroughly washed with hot saline solution, without drawing any of the intestines out of the wound except the portion containing the perforations.

The excess of saline was removed, and the wound closed with a cigarette drain one-half inch in diameter passing to the pelvis. Time consumed in operation was forty-five minutes. Shock, which was severe, the pulse being 172, was combated with an infusion of 1000 cubic centimetres of normal salt solution and with saline enemata. Six hours after the operation his temperature was 107° F.; forty-eight hours after that it was normal. After that it ran an irregular course, partly due to his typhoid and partly to a deep infection of the whole abdominal wound, which necessitated opening of both the skin and the rectus sheath. The pelvic drain was removed at the end of a week. The bowels were moved on the fourth day. The Widal reaction was positive after the operation. Convalescence after the first week was steady and uninterrupted.

PISTOL-SHOT WOUND OF THE ABDOMEN.

DR. ELLSWORTH ELIOT, JR., presented a young man, aged twenty-five years, who was admitted to Gouverneur Hospital last June, suffering from a pistol-shot wound of the abdomen. Two hours after his admission, when Dr. Eliot saw him, the patient complained of abdominal pain and tenderness. There were no evidences of shock, and his general condition was so good that it seemed as though the bullet had been deflected from its course and had traversed the circumference of the abdominal wall rather than penetrated the cavity. The point of entry of the bullet was just

below and a little to the right of the umbilicus, and an incision was made with this point as its centre. As the incision was deepened, it was found that the peritoneal cavity had been penetrated. The peritoneum was thereupon divided, and, after evacuating a small amount of blood and fæces, ten perforations of the small intestine were found in a section of the gut not more than three feet long and some twenty inches away from the ileocæcal valve. Each perforation was exposed, and closed by means of a purse-string suture; the suture was passed through the serous and muscular coats of the intestine and tightened after inverting the perforation, so that the opening was inside of the gut. In two perforations which were situated near the mesentery this procedure was not followed on account of the danger of including a large-sized vessel in the suture: they were closed, instead, by means of a double row of Lembert's sutures.

In addition to the perforations of the gut, there were two perforations of the mesentery, one involving a vessel of considerable size.

After thoroughly cleansing the abdominal cavity, the wound was closed layer by layer, with drainage. Twenty-four hours after the operation the patient passed gas per rectum, and forty-eight hours later he had a movement of the bowels. A slight, localized peritonitis developed, but otherwise the patient made an uneventful recovery, and at the end of the fifth week complete healing of the wound had taken place.

CAVERNOUS ANGIOMA OF THE NECK.

DR. ELIOT presented a man, thirty-five years of age, from whom, in 1885, a small angioma was removed from the left sub-maxillary region. The patient remained free from recurrence for five years, at the end of which time a small lump about the size of a hazel-nut appeared just above and behind the old scar; this growth remained stationary until five years ago, since which time it has grown steadily until at present it is as large as a grape-fruit.

On two occasions, the last six weeks ago, the swelling has become hard and incompressible, while the corresponding tonsillar region showed signs of acute inflammation. During these attacks the pulsation of the tumor also disappeared. After a time, with subsidence of the inflammatory symptoms, the tumor again became soft, elastic, and pulsating.

On examination, the left side of the neck is the site of a rounded, oval, colorless swelling, extending from the hyoid bone to the ear behind, and from a point two inches above the left sternoclavicular region to the zygoma above. There is a pronounced expansile pulsation and a loud bruit localized over the region of the tumor. Pressure on the artery below checks pulsation and bruit, and is accompanied by a slight diminution in the size of the tumor, which is still further decreased by pressure.

Examination of the tonsillar region shows a slight protrusion of the mucous membrane into the cavity of the pharynx. The patient's general condition is excellent.

Operation.—Gas and ether anæsthesia. An incision was made along the anterior border of the sternomastoid muscle, extending from the sternoclavicular articulation to the zygoma above, and was slightly curved over the most prominent portion of the tumor. The incision was deepened below, exposing the common carotid artery, around which a provisional ligature was thrown but not tightened. The artery was half again as large as is generally the case. The tumor was then gradually enucleated from below upward and laterally, its communications with the external jugular vein, the temporomaxillary vein and the external carotid artery being divided between two ligatures. The largest artery was about the size of a radial. After the removal of the tumor and the ligation of all bleeding points, the external carotid artery was identified in the zygomatic fossa and ligated above and below, to diminish the possibility of recurrence of the growth. The artery lay for a distance of several inches close to the deep surface of the tumor.

The wound was closed with interrupted silk sutures and a sterile dressing applied. The general condition of the patient at the end of the operation was excellent.

The patient made an uneventful recovery. The greater portion of the wound healed per primam. Near its centre a small salivary fistula persisted for several weeks and then closed. There has been no recurrence since.

The tumor removed was an angioma of the cavernous type. The largest vascular space was situated in the centre of the tumor and was about the size of a lemon. There were numerous other smaller cavities distributed through the substance of the growth.

A REVIEW OF THREE CASES OF TYPHOID PERFORATION.

DR. F. TILDEN BROWN read a paper with the above title, for which see *ANNALS OF SURGERY* for March.

DR. WOOLSEY referred to the selection of an anæsthetic in operations of this character. In two cases where he employed cocaine anæsthesia, the result was not very satisfactory, and he would not resort to this anæsthetic again in similar cases unless it was absolutely necessary. The use of ether or chloroform is preferable. The incision through the abdominal wall is easily and painlessly made under cocaine, but the resulting shock seemed much greater than when a general anæsthetic is employed. In one of the two cases where he used cocaine, a median incision was made, but, as the perforation was within two inches of the ileocæcal valve, it was necessary to retract the right edge of the wound very strongly; this gave rise to considerable pain, and seemed to increase the shock.

In all his cases, Dr. Woolsey said, the perforations were within fifteen inches of the ileocæcal valve.

DR. A. J. MCCOSH said he quite agreed with Dr. Woolsey that a general anæsthetic was preferable to a local one in these operations. The speaker said he has observed that patients suffering from typhoid fever stand both the anæsthetic and the operation very well, and that there is less shock after the use of chloroform, if the drug is judiciously administered in small quantities, than after the use of a local anæsthetic.

DR. KAMMERER said his own experience was corroborative of the statement made by Drs. Woolsey and McCosh that the shock after cocaine anæsthesia was greater than that after general anæsthesia, a point to which Henle, of Von Mikulicz's clinic, had called attention a year or so ago.

DR. BLAKE said that in all the cases of typhoidal perforation which had come under his observation, the muscular rigidity was the most constant and reliable symptom. In one case of supposed intestinal perforation where he was called upon to operate, muscular rigidity was absent, and the operation failed to reveal a perforation. He did not think that the blood-count gave us much clue as to the onset of peritonitis.

DR. HOTCHKISS said he had operated upon two cases of typhoidal perforation. In both instances the perforations were

near the ileocæcal valve, and were readily found on the anterior wall of the ileum. In both cases peritonitis had already developed, and both had ended fatally.

DR. KILIANI referred to two cases upon which he had operated last spring. In both cases the perforations were situated near the ileocæcal valve.

DR. BROWN, in closing, said that in his last case the perforation, which was firmly covered by omentum, was situated about six inches from the ileocæcal junction. In another case it was situated about fourteen inches from the ileocæcal junction. The three perforations in the other cases were not definitely located, excepting that one of them was quite near the cæcum.

HÆMORRHAGE FROM THE SPLEEN IN TYPHOID FEVER.

DR. F. KAMMERER showed the specimen of the case of hæmorrhage from the spleen in a typhoid patient of the third week, to which he had referred at the last meeting of the Society in connection with Dr. Brewer's paper.

The specimen was a very large spleen, with a rent in the capsule of about eight or nine inches. The substance proper of the organ, on careful examination after extirpation, proved intact. No fissures or tears could be discovered. The hæmorrhage had evidently arisen solely from the capsular lesion. There were no other sources of hæmorrhage discoverable at the time of operation, and a careful examination of the abdominal viscera at the autopsy revealed nothing in this respect. Before the operation, it was evident that hæmorrhage was going on, although the diagnosis of intestinal perforation was made in addition. The patient had been rather restless in bed, but no trauma was noted in the history of the case which could be held responsible for the lesion in the spleen. It was not until some search had been instituted that the real seat of the injury was found. Immediately on opening the peritoneum a large quantity of liquid blood escaped. The pelvis was filled with clotted blood. The intestines were rapidly passed through the operator's fingers several times, but no perforation was found. Both flanks contained large clots, which were removed after extending the incision from the symphysis to the ensiform cartilage. On retraction of the left border of the abdominal wound the very large spleen was exposed. On its under surface a long, adherent clot was noticed, from the base

of which at several points active hæmorrhage was going on. The clot was easily removed, exposing a straight tear in the capsule, about four inches long, from which the splenic tissue protruded like a mushroom. The hæmorrhage had now become more severe. Upon slight manipulation with the spleen, to more fully expose the lesion, the capsule, evidently under great tension even now, suddenly tore for an additional five or six inches. Immediately a much larger portion of the soft, sponge-like splenic tissue protruded from the rent, the hæmorrhage meanwhile becoming alarming. As previously mentioned, the only chance for the patient's recovery seemed to lie in extirpation of the organ, which was readily accomplished. All hæmorrhage now ceased, and the patient lived for another twelve hours.

The speaker desired to report this case more fully, as an exhaustive article had lately appeared in Langenbeck's Archives from the clinic of Kehr, of gall-stone fame, by Dr. Berger, on injuries to the spleen. This author had collected 132 cases of rupture of the organ, among which there were five patients suffering from typhoid fever. He mentions isolated rupture of the capsule as a most rare occurrence, and furthermore states that "lesions exclusively of the capsule are without danger, because they do not cause hæmorrhage." As the publication mentioned bears evidence of painstaking investigation of the literature of the subject, it would be fair to conclude that fatal hæmorrhage from a capsular lesion only, in the spleen, was a very rare, but still possible, occurrence, depending, very likely, on the pathological condition and large size of the organ.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, November 3, 1902.

A. J. OCHSNER, M.D., in the Chair.

RECTOVESICAL ANASTOMOSIS FOR EXSTROPHY OF THE BLADDER.

DR. E. J. SENN presented a case of exstrophy of the bladder, saying that he had exhibited the patient two years ago. At that time considerable discussion arose with reference to the prognosis. He showed the patient now for the purpose of demonstrating the possibility of performing vesicorectal anastomosis successfully, and without causing infection of the kidneys. Two years ago he made an anastomosis between the bladder-wall and the rectum. Examination of the urine before the operation showed a considerable amount of albumen and granular casts. At the present time the urine shows no albumen, but a few granular casts; specific gravity, 1015; reaction, slightly alkaline.

In doing the operation, he modified somewhat the procedure described by Dr. Jacob Frank, in that he made the anastomosis in a way similar to the manner one would make a colostomy. A longitudinal incision was made at the bas-fond of the bladder; then he drew up what he supposed to be the rectum or last part of the sigmoid through the incision, then united the bowel to the bladder-wall. At the end of three days he made an incision in the bowel and sutured the mucous membrane of the bowel-wall to the mucous membrane of the bladder, in this way securing a continuous layer of mucous membrane, or, in other words, the mucous membrane of the bladder was continuous with the mucous membrane of the bowel. Careful examination of the patient at present showed the fistula had remained patent. After having made the anastomosis, he did a plastic operation. The patient

had an exceedingly long prepuce; he button-holed the prepuce, drew it over the penis, bringing the penis through the button-hole, thus securing closure of the lower portion of the bladder. He sutured the parts as well as he could, freshened the surface of the penis, and secured primary union. After having transposed the prepuce, he next attempted to close the defect. He brought down the flap from the median line and sutured it to the margin of the transposed prepuce, and did practically a Wood operation. There was too much tension, and the operation failed. He made two large triangular flaps. One flap was transposed from the right side, the other from the left side, the two flaps sutured together over the defect. As there was a somewhat limited blood supply, the apices of the flaps sloughed. While he succeeded in covering a considerable portion of the defect, the operation itself was not entirely successful. A month ago the patient returned to him for a subsequent operation, and during the last two weeks he had succeeded in closing about two inches more of the defect, so that at the present time there remains but little to close. He said he had a superabundance of tissue surrounding the defect, so that by doing a plastic operation he thought he would succeed eventually in closing the defect entirely. His object was to show the state of the mucous membrane before closing the bladder entirely. Two years ago, before operation, the mucous membrane was covered to a considerable extent by fungous granulations. Since the operation these granulations have disappeared. At the present time the urine is clear, denoting no infection whatever. In doing the second operation, the entire defect remained closed for three days, during which time the patient urinated entirely through the rectum.

He intended to exhibit the patient again, when he had succeeded in closing up the small gap which remained.

As regards the mortality, he thought this operation was preferable to the Maydl, and believed that there should be as little mortality from it as from colostomy.

DR. L. L. McARTHUR said he presented a case some years ago before the Chicago Medical Society of this nature. The bladder was covered in by flaps from the abdominal wall. The median flap had hair-follicles in it, and in that particular case the hair grew, and a phosphatic deposit occurred upon it, so as to cause trouble. He asked Dr. Senn whether any trouble had

arisen in his case from this source, to which Dr. Senn replied there had not. He also asked whether gases and fæcal matter had troubled the patient by escaping through the fistulous tract.

DR. SENN said there had been a little trouble as regards fæcal matter; that small particles of it came through the fistulous tract, also some gas; but when the patient took a laxative he had very little trouble, strange to say. He thought, when the entire defect was closed, the constant stream of urine would prevent the escape of any fæcal matter. In this case he had expected to get infection of the kidney, but this had not occurred.

DR. JACOB FRANK thought that when the fistula now existing was closed, there would not be any trouble from fæces, because he had found in experimenting on dogs that if he took the healthy bladder of the animal and anastomosed it with the rectum, there was, first, a severe inflammation of the bladder; but when the animal recovered from the operation, the bladder contracted, and the vesical mucous membrane took on the characteristics of the mucous membrane of the rectum, showing that the bladder could accustom itself to a foreign substance, and also more or less infection. After the dogs had recovered, there was very little trouble from that source.

He did not think the method pursued by Dr. Senn was ideal. However, it was in its infancy, and he doubted whether enough of these cases presented themselves to any one surgeon to enable him to work out the problem satisfactorily. His idea would be not to transplant the skin, but he would dissect off the bladder or mucous membrane, as was done by Dr. Halstead; the bladder grows in fan-shape, and after it was dissected off and brought over the coupler, he would close the opening where the bladder was. In this way a new bladder can be made. The bladder could be dissected off all around completely, as was shown in the case of Dr. Halstead. Instead of using the Murphy button in these cases, he had used his absorbable coupler. He thought it would be much safer to anastomose the bladder to the rectum or the sigmoid, as was done by Dr. Senn; and after that had been done to dissect off the entire bladder, freshen the edges, and whip it over the coupler or the opening.

DR. EISENDRATH asked how long the patient could hold the urine, and what effect upon the bowel movements resulted from

the presence of such a large quantity of fluid in the rectum constantly?

DR. SENN said that the urine did not pass into the rectum at the present time, owing to the defect. During the three or four days he had the entire defect closed, the bowels moved two or three times during the day. He recalled a case in which the late Professor Fenger did a Maydl operation where the patient had two bowel movements a day.

DR. A. E. HALSTEAD stated that if he had another case of exstrophy of the bladder to operate on he would resort to the same method as in the first one, namely, doing a vesicosigmoidal anastomosis with the button. He would use the Murphy button in preference to the Frank coupler. Dr. Frank had said that a new bladder could be made by dissecting the posterior bladder wall free and folding it over the coupler. By not taking the whole thickness of the bladder-wall, but by dissecting off the mucous membrane, which one could do very nicely, because it was extremely thick and vascular, and, leaving the fascia behind to keep the abdominal cavity closed, there would be comparatively little danger of infecting the peritoneum. In doing this, by using the triangular flap, one could close in the button and make a practically intact bladder, drop it back, and bring the recti muscles together. By using the skin from the penis or the foreskin, one could close the lower part of the defect. In his case the defect was closed perfectly. Although the patient died thirty hours after the operation, the bladder was found intact at the post-mortem examination. His reason for using the Murphy button in preference to the Frank coupler was that the former could be used to advantage in shortening the time of operation; one could separate the two halves of the button, but this could not be done with the coupler. This was one of the objections to the use of the coupler.

DR. FRANK desired to say a few words in reference to the question asked by Dr. Eisendrath about the retention of urine in the rectum. In his experimental work on dogs, after an anastomosis had been made, for the first few weeks the dog passed fæces mixed with the urine, but after the animal accustomed himself to the new condition, he would pass urine separately; the fæces became formed.

DR. SENN, in closing the discussion, said in the present case,

in attempting to dissect up the bladder, he opened into the peritoneal cavity. He closed this opening in the peritoneal cavity, and there was no infection. Dissecting up the bladder-wall he regarded as a difficult operation, because the abdominal wall was very thin in these patients, and in opening the peritoneal cavity there was considerable risk of infection. Furthermore, in doing these operations surgeons attempted to do too much. To perform an anastomosis, and then attempt to close the entire defect at one sitting, was doing too much. In doing so many operations upon the present patient, he thought he had erred in trying to do too much at any one time. In doing plastic operative work on the genito-urinary organs, one should do a little at a time. If one attempted to do too much, there was extravasation of urine, infection, loosening of the stitches, and the operation was a failure, as a rule. It was only in the later operations on this patient that he attempted to do a little at a time, and this was when he began to be successful in the work. Where he has had to operate a number of times upon one patient, he had relied on whiskey as an anæsthetic, giving from one-half ounce to an ounce of whiskey, with one-half grain of morphia, and the patient had undergone minor operations without any pain whatever.

RENAL CYSTINE CALCULUS, WITH RIGHT NEPHROLITHOTOMY, RIGHT NEPHRECTOMY, FOLLOWED
LATER WITH ANURIA, REQUIRING A LEFT
NEPHROSTOMY; RECOVERY.

DR. L. L. McARTHUR read a paper with the above title.

DR. ARTHUR DEAN BEVAN said there was one point of great clinical importance developed by this case, and one, perhaps, that had been usually overlooked, and that is the relationship between the existence of one working kidney in an individual and the occurrence of complete anuria. When anuria developed, it did so in an individual who had but one working kidney. It was certainly a great rarity to have obstruction of the two ureters occur simultaneously. In this particular case one kidney had been removed, and therefore there was but one working kidney, and obstruction of the ureter of the single working kidney would develop the symptoms described. He was inclined to believe that anuria of a single kidney, or rather the obstruction of the ureter of a single kidney, was very much more common than one was

apt to realize. He believed, as a general proportion, it occurred in all cases of renal colic. There might be exceptions to this, but he thought, if surgeons could absolutely keep track of the function of the two kidneys in cases of kidney colic, they would find that temporary anuria of one kidney was the rule. When one realized the small size of the ureter, it was not strange that a stone sufficiently large to block the ureter might escape detection. This led him to suggest the possibility that Dr. McArthur had to deal with the blocking up of the ureter by a stone, and not by the cystine crystals themselves, and that the stone was of such a small size that it escaped detection. A stone the size of a grain of wheat was large enough to block the caliber of the normal ureter, which had not been dilated by the passage of a previous calculus, and a stone of several times the size of a grain of wheat was undoubtedly frequently passed, especially by the female, without any sensation, and without attracting the attention of the individual, or without being found. Of course, the question as to the difference between a lot of cystine crystals together having produced obstruction and the obstruction produced by the mass of cystine crystals which had formed into a calculus would not be very great, yet, without much doubt, the consolidating mass of cystine forming a stone would mechanically be more liable to produce obstruction than the loose crystals. Ultzmann, in his collection of some 800 stones, had eight cases of cystine calculi among them, most of them vesical, three of which were not seen under personal observation. Henry Morris, in his collection of the cases between 1883 and 1893, in British, Continental, and American literature, found reports of 230 cases of renal calculi, of which the passage of the stones was only mentioned in seventy-seven, and of these seventy-seven, two were cystine; that is, out of 230 stones, two were known to have been cystine, showing the percentage to be about one per cent. Analyses were made of the Hunterian collection of stones, and the proportion of cystine calculi among them was found to be about 1 per cent. An analysis of the stones in the British Museum was made, and the percentage was found to be a little less than 1 per cent. But if, in one case in 100, surgeons were going to find them, Dr. McArthur thought they were of sufficient moment to pay attention to. The fact that the urine sometimes smelled very strongly of sulphuretted hydrogen should be a rather significant

one in this connection, for the probable source of the sulphuretted hydrogen was to be found in these cystine crystals. Thinking that the cystine calculus had been overlooked in the X-ray picture on the left side, every drop of urine from the time the anuria occurred until ten days had elapsed was saved and collected in glass vessels, and the bladder was washed out two or three times with a fairly wide catheter to see if any calculus, which might have occluded the ureter, would escape. But none was found. After tension had been relieved, a glass catheter was inserted, through which a stream of yellowish, sandy-looking material escaped, making one think at first of uric acid, but, on taking this material to the laboratory and having it examined, it proved to be a mass of cystine crystals, leading the essayist to think that there was simply a thick bunch of shingle-like crystals which had blocked the ureter.

DISLOCATION OF THE INDIVIDUAL CARPAL BONES.

DR. WM. HESSERT read a paper with the above title, for which see *ANNALS OF SURGERY* for March.

DR. ARTHUR DEAN BEVAN said he had made fifty or more Colles's fractures on the cadaver, and then made dissections of the injury done after the fracture was produced. This fracture was easily produced on the cadaver by overextension of the hand, although it required considerable power to do it. In the fifty or more cases of Colles's fracture which he had produced, he had never seen a single dislocation of any of the individual bones of the carpus, nor a dislocation of the wrist, that is, between the radius and ulna and the first row, or between the two rows, or between the second row and the metacarpal bones. Injuries made in this way experimentally had invariably been fractures of the radius or ruptures of the ligaments without displacement, and sometimes a fracture of both the radius and ulna at the lower end, but never a dislocation of the carpal bones themselves.

While the essayist had taken the position that these cases were more common than surgeons realized, he was rather inclined to take the old view that they were quite uncommon, judging from his experience in his experimental work, and from his own limited experience in private and hospital practice.

Another interesting point in this case was the very marked nerve injury. This, to his mind, was the important injury. This

was interesting because it was rather a paresis than a paralysis, the intercossei muscles being intact. The ulnar nerve supplies all muscles of the little finger, the interossei, the two ulnar lumbricales, and the one and a half muscles of the thumb, the adductor, and half of the short flexor. In the case presented, he thought one muscle was singled out more than any other, namely, the adductor of the thumb. This muscle was almost entirely atrophied. It felt as though there was no muscle mass in the web between the index-finger and the thumb. The muscles of the little finger had some power; the interossei were still intact, although their power was much diminished. The explanation of this was, he thought, the contusion of the ulnar nerve at the time of the original injury. He had seen these nerve contusions where, after a long period of time, the function was almost entirely restored, and believed the prognosis fairly good in this case.

INFLAMMATION AND PERFORATION OF MECKEL'S DIVERTICULUM AS A CAUSE OF SEPTIC PERITONITIS.

DR. A. E. HALSTEAD read a paper with the above title.

DR. ARTHUR DEAN BEVAN said he had had some cases in which the remains of the vitelline duct persisted and gave evidence of trouble. He had had two cases of obstruction of the bowel produced by the remains of the vitelline duct, but had never had a case of diverticulitis in his own work, unless he had one at the present time. A woman was admitted to the hospital with a suppurating fistula at the umbilicus; a large pancake-shaped abscess, about six inches in diameter, was found on opening the abdomen, into which the fistula ran. The abscess was between the parietal wall and omentum. It was filled with pus, and in the pus was a fragment of wood that seemed to be a third of the size of an ordinary tooth-pick, which was macerated. It would seem, from the location of the condition and from the foreign body found, that it was a case of abscess due to perforation of the remains of the vitelline duct from the piece of wood which eventually perforated at the umbilicus.

A professional friend of his told him that, about a year ago, he had a case of diverticulitis upon which he had operated, with the idea that it was a lesion of the appendix. The patient recovered, and in less than two weeks this same physician had had a second case of diverticulitis. He did not know whether

these cases had been reported or not. He mentioned this to show that the condition was more common than was formerly supposed. When it was realized that fully 5 per cent. of the cases of obstruction of the intestine were produced by the remains of the vitelline duct, and that cases of diverticulitis were gradually creeping into medical literature, surgeons should realize that the condition was one of very great importance; it should be looked for both from the stand-point of ileus and peritonitis.

EDITORIAL ARTICLE.

INTRAMEDIASTINAL BRONCHOTOMY AND ŒSOPHAGOTOMY.

At the meeting of the Society of Surgery of Paris of March 20, 1901, Ricard¹ reported an experience with a woman, thirty-nine years of age, who had worn a tracheal cannula since infancy, subsequent to a tracheotomy done on account of ulceration of the larynx that had supervened upon an attack of typhoid fever. Notwithstanding this, she was enjoying perfect health, when, during the evening of November 14, she was seized with a sudden paroxysm of suffocation owing to the intratracheal portion of the cannula having become detached and having fallen into the air-passages. After the first seizure of suffocation had passed away, she suffered little inconvenience. A radiograph showed the cannula resting at the bronchial bifurcation, its small end dipping into the right bronchus. Efforts to seize and extract the tube by forceps introduced through the tracheal opening above were fruitless, and provoked grave threats of asphyxia. M. Ricard then, on the 17th of November, resected the upper half of the sternum, uncovered the trachea near its bifurcation, and palpated it repeatedly, but could not feel the cannula either in the lower part of the trachea or at the beginning of the bronchus. Ceasing further efforts, he placed a gauze drain in the mediastinal wound and closed the superficial flap. The later course was disastrous; after two days of well-being, on the third the temperature rose to 102.5° F.; by the fourth, symptoms of gangrene of the lung had developed; on the sixth day death occurred with asphyxia after progressive dyspnœa.

¹ Ricard: *Contribution à l'étude de la chirurgie du médiastin antérieure*, Bull. et Mém. de la Société de Chirurgie de Paris, 1901, t. xxvii, No. 11, p. 304.

Notwithstanding the lack of benefit resulting from this attempt, the reporter very justly says that he has thought it of advantage to communicate to his colleagues the observations which his attempt had enabled him to make, especially as he found that the technique which he had used afforded a wide and easy access to the upper part of the anterior mediastinum, which might be useful in other cases and in other conditions.

His incision started from the left sternoclavicular articulation, followed the upper border of the sternal notch, extended for about a centimetre along the right clavicle, and then descended perpendicularly parallel to the right border of the sternum and about four centimetres from it. Having reached the upper border of the third rib, it made a right angle and returned horizontally to the sternum, which it crossed to its left border. Thus he made a U-shaped incision, the convexity of which was about four centimetres to the right of the sternum, and the upper leg of which ran along the sternal notch.

This flap was dissected up so as to expose the costal cartilages and the right half of the sternum; then with a periosteal elevator the soft intercostal tissues were detached, and the cartilages were divided by a bistoury from their connection with the ribs, and by the elevator and the finger the soft tissues behind the costal cartilages and the sternum were pushed back. This dissection was accompanied with but an insignificant amount of bloody oozing.

To uncover the mediastinum, he separated the sternum from the clavicle, and divided it along its middle throughout the whole extent of the exposed part. The only delicate part of this step was the sternoclavicular disarticulation, owing to the close relations of the posterior face of this articulation with the brachiocephalic venous trunk. He made use here of a narrow cutting forceps, such as have been used for craniectomy, and with great facility gnawed away the articulation from its superficial to its deep part. The vertical section of the sternum was quickly made by a cutting bone forceps. The soft parts of the upper portion of the mediastinum were thus exposed. He was readily enabled

to detect and push back to the right the pleural cul-de-sac and the edge of the right lung without wounding them, and without producing any noticeable modification in the respiratory rhythm. The mediastinal surface of the right pleura was separated with much ease, so that the superior vena cava was brought into view and recognized by its vertical direction, its alternations of emptiness and of repletion, as well as its considerable size.

The connective tissue in this space is very loose, so that the arch of the aorta is readily enucleated, but not so easily controlled by a retractor on account of the extensive changes of position which it is constantly making. Its volume seemed to the observer to be much greater than is seen in injected cadavers, even though the injections had been made with the greatest force.

By separating the vena cava and the aorta, and rather behind the aorta, the trachea was found, recognizable to the touch by its elastic rings. The operative field is absolutely bloodless, but the operator is embarrassed by the expansile movements of the lung, and the excursions of the aorta, so that he can seize the trachea only during the retreat of that vessel. During its diastole the aorta projects into the field of work and hides the deeper plane. Nevertheless, with the greatest clearness he was able to see the whole of the superior vena cava, the mediastinal surface of the pleura, the peritracheal glands, and the trachea. As soon as the retraction of the mediastinal tissues is withdrawn, the cavity artificially created by the operator fills up spontaneously, owing to the elasticity of the contained organs. The drainage of the lower part of the wound and the suturing of the periosteocutaneous flap present no difficulties.

His observations in this operation upon a living subject suggested to Ricard the following reflections:

The resection of the upper part of the sternum and of the adjacent costal cartilages allows the upper part of the anterior mediastinum to be explored with facility. It is possible to avoid opening the pleural culs-de-sac near the median line. With care there is no serious hæmorrhage. The breach thus created does

not permit of exploration below the bronchial bifurcation on the right side. The entire left bronchus is out of the field entirely.

At this level the bifurcation of the trachea and the beginning of the right bronchus are at a depth of ten centimetres from the surface. The superior vena cava enters the pericardium, and is with difficulty pushed aside. The pulmonary veins skirt the upper border of the bronchus. The pericardial sac ascends upon the aorta, setting a definite bar to surgical intervention lower down; hence the advice to limit the sternal resection at the level of the upper border of the third rib, since the enlargement downward of the operative space is useless and dangerous.

On the other hand, the higher up one goes, the more accessible the vena cava becomes; the more the aorta deviates to the left, the easier is it to reach the trachea. Any attempt to suture the trachea in this space is not to be thought of on account of the depth and narrowness of the space, the excursions of the aorta, the alternating distention and collapse of the vena cava, the pulsations of the heart, and the pulmonary expansions which obscure the operative field and make their wounding by the needles hardly possible to avoid.

Ricard proceeds to compare his experience with that of Milton,² of Cairo, who published in *The Lancet* of January 26 last an account of a similar accident, the fall of a detached tracheal tube into the deeper air-passage, in which the effort to secure the tube through an incision in the mediastinal portion of the trachea was successful, but was followed by death on the third day thereafter from acute sepsis. Milton gained access to the mediastinum by dividing with a saw the sternum in the median line from end to end, after suitable incision of the superposed soft parts, and then drawing the two halves of the sternum apart by the traction of strong retractors. The chief hinderance to ready separation was the fibrous fasciculi on the posterior surface of

² Milton: Removal of a foreign body from the bronchus by intra-thoracic tracheotomy, *The Lancet*, January 26, 1901, Vol. clx, p. 242.

the manubrium. After these had been carefully divided by a bistoury the segments of the sternum were easily separated to a distance of four centimetres at their upper part. At first the bifurcation of the trachea could not be brought into view, but by inserting a hook into the old tracheotomy opening in the neck and strongly drawing the trachea upward, while the innominate vessels were held aside, the bifurcation was clearly visible. Milton remarks upon the absence of shock and of hæmorrhage during these manipulations, and upon the ease with which the retro-sternal vessels were protected. It was easy to avoid injuring the pleura, and there was no interference with respiration.

An incision of about two centimetres in length was then made into the anterior surface of the trachea just above the bifurcation; some ill-smelling mucopus escaped through this opening and was wiped away; by separating the edges of this cut the interior of the trachea as far as the right bronchus was seen, but the metal tube did not come into view; the little finger being introduced and carried into the right bronchus felt the tube, and guided by this a delicate forceps was introduced and made to grasp the tube; the first efforts to extract the tube were unsuccessful, owing to the impaction of the enlarged portion of the tube within the swollen mucosa of the bronchus; but in the course of the efforts to disengage it the tube became partially rotated, and was then extracted without difficulty.

An attempt to suture the trachea was made, but the result was very imperfect. A mesh of dermatol gauze was placed behind the sternum as a drain, emerging above near the ancient tracheotomy opening. The halves of the sternum came together spontaneously as soon as the retraction was suspended, and the skin wound was sutured. During the night of the day following the patient died, and autopsy revealed an acute mediastinitis and an incipient double pneumonia.

Milton perceived that his patient died from sepsis, and that this result was due to the defective drainage of the wound and

to the looseness of the mediastinal connective tissue, which favors to a marked degree infection. He says that "were he to perform the operation again, he would modify the procedure after the removal of the foreign body by making no attempt to suture the tracheal opening, and instead, having removed the greater part of the manubrium sterni, through the large opening thus afforded insert a copious gauze plug down upon the tracheal wound so as to occlude it. The halves of the sternum below the resected part he would suture together with silver wire; the skin wound above he would suture and cover with collodion and gauze."

Ricard very reasonably criticises this proposed technique of Milton by condemning the unnecessary extensive and severe procedure of bisecting the sternum and forcibly drawing asunder the halves, to be followed by the later resection of the manubrium, when, if this last procedure is done first, a wider exposure of the mediastinum is at once secured, rendering the other attack unnecessary.

These two cases illustrate well the possibilities, the difficulties, and the dangers of attacks upon the air-passages through the anterior mediastinum. In both instances a fatal result was not prevented; in the one case because the trachea was not opened and the foreign body was left *in situ*; in the second case, because the trachea was opened and the foreign body was removed. Both cases reflect great credit upon the surgical resourcefulness and operative boldness of the operators; though these particular efforts were not crowned with success as far as the saving of life is concerned, still, they cannot fail of being helpful in solving the problem of mediastinal antisepsis whereby similar attempts in the future may possibly be carried to a successful conclusion. The future successful mediastinal tracheotomy will in all probability combine the following steps: (*a*) The sternal resection of Ricard; (*b*) the exposure of the trachea by the pushing back of the pleura and the holding aside by retractors of the great

retrosternal vessels; (c) the lifting up of the trachea by traction from above through a hook inserted into the old tracheal opening in the neck; (d) the incision into the trachea just above its bifurcation; (e) the exploration of the bronchi through the wound, the detection and the removal of the foreign body; (f) the tamponade of the anterior mediastinum, with the external wound left widely open to afford unrestricted exit of wound discharges; (g) later secondary suture or healing by granulation as the case may require.

At a meeting of the Surgical Society of Paris subsequent to the one at which Ricard made his report, Quénu³ resumed the discussion of the best method of reaching the trachea and the bronchi, calling attention to the advantages presented by a choice of the posterior mediastinum as the path through which to approach them. His opinion was based upon experiments on the cadaver. Several times he had introduced a small cannula into the trachea through an incision in the neck, and had driven it down by blowing in air from above. Each time he had later found the cannula in a bronchus. He had expected, if the operation allowed of easy access to the bronchi, that the foreign body would be felt by the finger through the membranous posterior wall of the tracheobronchial tube. Such was indeed the fact, and in each instance he was able to appreciate the cylindrical projection of the cannula, and to cut directly upon it.

The technique pursued by him was as follows: If it is the right bronchus that is to be reached, the subject is placed upon its left side, the left arm hanging down; an incision five and one-half inches long, starting from the third rib and extending to about the eighth, is made along the spinal border of the scapula; two incisions at right angles to each end of this make a flap, the base of which corresponds to the middle of the vertebral

³ Quénu: *De l'extraction des corps étrangers tracheo-bronchiques par la voie médiastinale postérieure*, Bull. et Mém. de la Société de Chirurgie de Paris, 1901, t. xxvii, No. 12, p. 317.

column. The incision is deepened through the muscles, and the musculocutaneous flap is dissected up. The third, fourth, fifth, and sixth ribs are resected, making an opening three and one-half inches long by three inches wide. The mediastinal pleura is peeled away to the outside and a broad retractor applied to the lung enveloped in its pleura; at the top of the wound the cross of the azygos vein is exposed; the œsophagus is recognized, and pushed back against the vertebral column; the left index-finger, thrust inward to the extent of three inches from the level of the ribs, feels very plainly the line of tubercles formed by the posterior ends of the tracheobronchial cartilages; an enlarged gland is enucleated and pushed downward out of the way; a toothed forceps is fixed upon the left border of the right bronchus, draws it down and brings its posterior surface into view; the index-finger, guided by the forceps, feels anew the line of the cartilages, a slight depression, and the relief produced by the projecting foreign body (*e.g.*, a cannula); the membranous wall being incised, the cannula is felt for and is extracted with a suitable polypus forceps.

This way of approach presents no great difficulties; the azygos vein is the chief vessel in the way, and it is always possible to divide it between two ligatures; the tracheobronchial rings are very plainly perceived, and equally so any hard foreign body through the membranous posterior wall of the air-duct. It is true that an operation on the cadaver is quite a different thing from an operation on the living subject; the respiratory movements are a positive embarrassment, but the lung may be depressed and should be pushed back by a broad retractor.

It is evident that these views of Quénu as to the superiority of the posterior mediastinum as a pathway to the bronchi are a further development of the observations made by himself and Hartmann in 1891 ⁴ with regard to the possibility of exposing the

⁴ Quénu et Hartmann: *Des voies de pénétration chirurgicale dans le médiastin postérieur*, Bull. et Mém. de la Société de Chirurgie de Paris, 1891, t. xvii, p. 82.

œsophagus through this same gateway. In that previous communication was made the important observation that it is much easier to enter the posterior mediastinum, and especially to isolate the œsophagus on the left side than on the right side of the vertebral column, even though the œsophagus lies on the right side of the vertebræ. This is due to the anatomical arrangement of the pleura on the two sides. The left pleura, hardly dipping down into the costo-aortic groove, is continued directly to the side of the posterior mediastinum, but the right pleura, after having covered the costal region, insinuates itself between the vertebral column and the œsophagus, passes the median line as far as to the right side of the thoracic aorta, where it forms a cul-de-sac near the left pleura; thence it returns clothing the posterior face of the œsophagus, and then goes to form the right wall of the mediastinum. It is easy to understand from this that the detachment of the left pleura would lead the operator directly to the œsophagus, while that of the right pleura would bring him behind this cul-de-sac upon the anterior face of the vertebral bodies, and still beyond to the thoracic aorta.

In the suggestion to approach the œsophagus through the posterior mediastinum, Quénu and Hartmann were preceded by Nasiloff⁵ in 1888, and were followed by Bryant⁶ in 1895. To actually make the attempt on the living subject seems to have been first ventured by Forgeue,⁷ of Montpellier, in June, 1897, upon the person of a child, eight years old, in whose œsophagus a

⁵ Nasiloff: Œsophagotomia et Resectio Œsophagi endothoracica, Vrach, 1888, No. 25, ANNALS OF SURGERY, Vol. viii, p. 308.

⁶ Bryant: The Surgical Technique of Entry to the Posterior Mediastinum, Transactions of the American Surgical Association, 1895, Vol. xiii, p. 443.

⁷ Forgeue: *De l'œsophagotomie intramediastinale pour corps étrangers de l'œsophage thoracique*, Congrès Français de Chirurgie, XII Session, 1898, Revue de Chirurgie, December, 1898, p. 1107.

large sou-piece had become impacted and retained for three months, notwithstanding intelligent efforts to extract it by instruments introduced through the mouth. A radiograph showed very clearly the sou fixed at the level of the fourth intercostal space, and well to the right of the bodies of the vertebræ. This latter revelation of the X-ray decided M. Forgue to enter the thoracic cavity on the right side of the vertebral column, contrary to the teaching of Quénu and Hartmann, recited above. The fourth, fifth, and sixth ribs were exposed and resected to the extent of five centimetres, the angle of each rib being in the centre of the resected portion. The parietal pleura was pushed back by the ends of the fingers until the right surface of the dorsal vertebræ was reached, now quite plainly, but at a depth of about eight centimetres. The thrust-in finger felt the projecting right border of the impacted coin, but it was out of the question to attempt an incision at such a depth. Continuing, an effort was then made to enucleate the œsophagus by following with the finger-tips the line of reflection of the mediastinal pleura so as to uncover the posterior face and right aspect of the œsophagus. The manœuvre succeeded only in making the œsophagus more movable anteriorly, so that it was crowded away forward with the retro-œsophageal cul-de-sac of the pleura, until it became no longer possible to feel the coin, or to find the plane of cleavage between the œsophagus and the pleura. At this point a threatened chloroform asphyxia caused a cessation of further attempts, and a copious iodoform gauze tampon was inserted; the upper part of the incision was sutured, and a double drain was put in the most dependent part of the opening. Twelve days later, the course of the wound having been aseptic, meanwhile, an attempt to extract the coin through the mouth was again made as a preliminary to a proposed effort to reach it by an anterior thoracotomy. This time the œsophageal snare caught the coin and delivered it safely!

An attempt to reach the œsophagus by the way of a posterior

thoracotomy was also made in two instances by Rehn,⁸ of Frankfurt on the Main, which he reported at the 1898 Congress of German Surgeons. His cases are interesting and instructive. The first patient, twenty-two years of age, suffered from a close stricture of the œsophagus, thirty-two centimetres from the incisor teeth. No sound could be passed. A gastrostomy had been done. It was determined to try and expose the affected portion of the œsophagus, and for this purpose a curved incision was made at the right of the vertebral column, through which about six centimetres each of the fourth, fifth, sixth, seventh, and eighth ribs were resected. The exposed pleura was quite easily pushed back, and the end of the sound previously introduced into the œsophagus was felt, but during a paroxysm of coughing the pleura was violently forced out and was torn upon the end of one of the cut ribs. Pneumothorax and collapse followed; the pleura was sutured, the wound was tamponed, and the operation suspended. Five weeks later, the pneumothorax having disappeared, the operation was resumed. This time the œsophagus was readily exposed. It was adherent to the adjacent tissues and was drawn towards the left. After it had been freed, a longitudinal incision was made into it and its lumen found, which was dilated by introducing into it a small crescent-shaped forceps. A permanent sound was introduced, the œsophagus was sutured and the wound tamponed. After the operation the pulse became progressively more rapid and feeble, and death ensued at the end of twenty-four hours.

In the second patient there was a carcinoma of the œsophagus, the secretions from which hindered stomach digestion; and it was proposed to ligate the œsophagus below the carcinoma and drain to the surface the secretions. As in the preceding case, the pleura was torn, this time on account of the extensive adhe-

⁸ Rehn: *Operationen an dem Brustabschnitt der Speiseröhre*, Verhandlungen der Deutschen Gesellschaft für Chirurgie, XXVII Kongress, 1898, Centralblatt für Chirurgie, 1898, No. 26.

sions which it had formed with the endothoracic fascia. The patient died at the end of six days from asthenia.

In November, 1898, Llobet,⁹ of Buenos Ayres, in the person of a girl of twenty years, for whom already a gastrostomy had been done on account of a stricture of the œsophagus due to the swallowing of a caustic liquid, entered the posterior mediastinum to the left of the vertebral column, after resecting about five centimetres each of the fourth to the eighth ribs. He reports that he was able to push back the pleura without wounding it and to expose the œsophagus without injuring any of the surrounding organs. Guided by an olivary bougie introduced from the mouth he was able to divide longitudinally the strictured portion of the œsophagus, and then to introduce and leave in place a tube inserted above through the nose and reaching to the stomach, through which further feeding was carried on. The patient, after doing well for three days, developed an infective pleuritis which ended fatally on the eighth day after the operation.

From this review of the published cases in which up to the year 1900 efforts had been made to reach the bronchi or the œsophagus through the mediastinal spaces, anterior or posterior, there was little to encourage its further practice. Operative procedures which may be successfully carried out upon a cadaver are attended with the greatest of difficulty and danger in the living subject. As Willard,¹⁰ who attempted bronchotomy on dogs, very pointedly remarks "the aspects of the parts during life and after death are as absolutely different as they can possibly be. A bronchus which after death is easily exposed, and which is reached with the greatest ease, I have seen five minutes previously absolutely enclosed with huge pulsating vessels of twice the size, any one of which, if punctured, would seriously com-

⁹ Llobet: *L'operation de Nassilov*, *Revue de Chirurgie*, 1900, t. xxii, p. 674.

¹⁰ Willard: *Intrathoracic Surgery; Bronchotomy through the Chest-Wall for Foreign Bodies impacted in the Bronchi*, *Transactions of the American Surgical Association*, 1891, Vol. ix, p. 345.

plicate, if not render the operation absolutely fatal. The alteration of the parts in life and in death can only be appreciated when seen."

After such a record of disaster, and in such difficult conditions, it is especially worthy of note that finally a definite cure has been achieved after a posterior mediastinal œsophagotomy. This is reported by Enderlen,¹¹ of Marburg, as having been secured in October, 1900, in the person of a man, twenty-nine years of age, in whose œsophagus, thirty-one centimetres below the teeth, an artificial denture had become impacted. An unsuccessful effort was first made to reach it through an opening into the stomach and to pull it down into the stomach. When this was found to be impracticable, the man was turned on his left side, and through a suitable incision of the soft parts from seven to ten centimetres of the fifth to the eighth ribs on the right side of the spine were excised. During the pushing back of the pleural reflection, this membrane was torn in two places and some lung collapse followed, but no threatening symptoms supervened. The œsophagus was made prominent by a bougie introduced from the mouth, and gradually it was uncovered, fixed by hooks, opened, and the denture was extracted, not without considerable bruising of the edges of the wound in the œsophagus. No sutures were placed in the œsophagus, but a copious tampon was left in, by means of which the later copious wound secretions were led to the surface. For a time feeding through the stomach fistula and by the rectum was resorted to. After six weeks feeding by the mouth was begun, but for some time there was some leakage through the wound. In the later course of the case an abscess of the liver and a subphrenic abscess developed, which were relieved by suitable incisions. He suffered much also from joint rheumatism, and the fistula in his back persisted a long time, but before the end of a year he had regained full health.

¹¹ Enderlen: *Ein Beitrag zur Chirurgie des hinteren Mediastinum*, Deutsche Zeitschrift für Chirurgie, Band lxi. S. 441.

REVIEWS OF BOOKS.

THE PRACTICE OF SURGERY: A Treatise on Surgery for the Use of Practitioners and Students. By HENRY R. WHARTON, M.D., and B. FARQUHAR CURTIS, M.D. Third Edition. Philadelphia: J. B. Lippincott Company, 1902.

It has become the fashion of late years to publish medical works on the co-operative plan. As long as publishers permitted their editors free scope in the choice of co-workers, this plan resulted in the making of books which contained the best thought and ripest experience of the day, since it is impossible for any one man to cover the vast field of general medicine or surgery. Thus the co-operative plan produced works which excelled in all branches of medical lore. Of late, however, the reviewer has noticed with regret that several very excellent works containing material of the highest order have nevertheless been marred by chapters of decided weakness. Subjects have been divided in a puerile manner, evidently with a view to interesting in the purchase of the book the largest number of medical centres. Commercially, no doubt, for the time being, that is a good policy and insures sales in localities which had otherwise been doubtfully profitable. That such a policy may be harmful to the scientific value of the work cannot be doubted. Ultimately it will certainly be detrimental to the commercial interests of the publisher, for just as soon as medical men learn that costly and bulky volumes written on the co-operative plan are no longer the product of the best authorities on individual subjects, but rather geographical mosaics, with some pieces precious and others potsherds, they will cease to invest their meagre earnings in the costlier works, and seek smaller and less pretentious volumes of a more uniform excellence.

The volume of surgery written by Drs. Wharton and Curtis, of which the third edition is now put forth, is a work of the latter class. That it has been appreciated accordingly is evident, since three editions have been called for in five years. It is needless to remark that the work has been profitable to its publishers. This fact teaches a useful lesson, showing that a knowledge of geography and the location of medical centres is not a necessity to the builder of a book for doctors. This work of Drs. Wharton and Curtis is remarkable for two things,—evenness and balance. A just appreciation of what is essential to the general practitioner and medical student has enabled the authors to condense within the scope of twelve hundred pages all the important facts in surgery, and all else that is necessary for the instruction of those for whom the work is designed. Material which is only useful to the specialist has been omitted with advantage. No attempt has been made to make this a complete treatise on the art of surgery in all its branches, and yet bring the matter within the boards of a one volume work. Such efforts have been made in the past and have always been failures, resulting in sketchiness rather than thoroughness. No such criticism can be levelled at this book; and while the authors modestly state that they cannot hope that all their critics will agree with them respecting the relative space assigned to the different topics, they will find few reviewers who will have a serious quarrel with them. If there is one thing that is evident in this volume more than anything else, it is the justness of proportion which the writers have given to their work. No better description of the book can be given than is found in the preface to the present edition. To quote the authors, their plan has been thus outlined. The information essential to the general practitioner, and which should appear in a one volume work, includes (1) a description of the various injuries and surgical diseases sufficiently full to enable the practitioner to recognize them in practical work. (2) Full directions for the treatment of such injuries and diseases as would usually

be attended by the general practitioner. (3) A sketch of the treatment of the more difficult conditions, such as would allow the practitioner to advise patients intelligently in obtaining special skilled surgical attention. (4) An outline of the accepted facts and theories of the etiology and pathology of the various surgical affections sufficient to form a foundation for the clinical picture and give directions for the treatment. The authors' statement of intention is as concise as their accuracy in carrying it out. They have done just what they set out to do, and have succeeded in producing, first, one of the best text-books for students that has been published in some time, and, second, a work which is of equal value to the busy doctor. There is one feature in the make-up of the book which the patriotic critic might object to, and that is the frequent use of illustrations from foreign authors. Medical chauvinism is to be deprecated, and we ought to be willing to appreciate good work whether in this land or on foreign shores; appreciate it, however, without appropriating it, even where, as in this volume, credit is given. It is not chauvinistic to wish that American authors would use their own material for purposes of illustration. To be sure, it costs more to make new plates, but it is worth while to bring the illustrations in a new volume of surgery up to date with the text, and a volume written by American authors ought not to be indebted to foreign works for so many wood-cuts.

ALGERNON T. BRISTOW.

MANUAL OF GYNÆCOLOGY. By HENRY T. BYFORD, M.D., Professor of Gynæcology and Clinical Gynæcology in the College of Physicians and Surgeons, Chicago, etc. Third edition, revised and enlarged. Octavo. Pp. 590, with 363 illustrations. Philadelphia: P. Blakiston's Son & Co., 1902.

The author in the third edition of this valuable manual has succeeded in producing for the general practitioner and student a concise and complete *résumé* of modern gynæcology.

The book has been arranged for ready reference, and by rearrangement of the parts, placing anatomy, physiology, gynæcological diagnosis, and the general principles of treatment in the introductory chapters, the student is led up to and given a better understanding of developmental anomalies and gynæcological pathology. The addition of marginal notes also adds to the book's usefulness in its intended field.

Exception must be taken to the author's description of the pathology of perineal lacerations, in not mentioning the injury to the levatores ani muscles and the pelvic fascia in tears of the pelvic floor, for, without a proper appreciation of the significance of the lacerations of these structures, reparative operations cannot be understood.

For the repair of complete tears, the preference is given to Tait's method, while no mention is made of Kelly's "flap" operation, which is distinctly superior to any other procedure when the sphincter has been torn.

Too much stress has been laid upon the local and medicinal treatment of gynæcological disorders, while operative intervention is placed, except in the treatment of the severer lesions and neoplasms, in a position of last resort. This is hardly consistent with the present gynæcological teaching.

The chapters on neoplasms are full and well worth careful study. Considered as a whole, the book is commendable and worthy of perusal. The illustrations are good and are of great explanatory value.

JOHN O. POLAK.

THE DEVELOPMENT OF THE HUMAN BODY. By J. PLAYFAIR McMURRICH, Professor of Anatomy in the University of Michigan. Pp. 500, with 270 illustrations. Philadelphia: P. Blakiston's Son & Co., 1902.

The book is a student's manual of embryology, in which the principles of that science are set forth in an exceedingly clear and

logical manner. Beginning with the primordial elements, the successive changes are described and illustrated until the full-grown foetus is developed. The classical embryos of Peters, Graf, Spee, and Kollmann are described in full, and the development of the special organs are taken up in detail in separate chapters.

The work is free from discussion of mooted subjects, and the practical bearing of embryology to surgery is but lightly touched upon. The author does not attempt to present anything new, but to give a concise *résumé* of the works of His, Minot, and other recent investigators. For one who wishes to gain a clear, accurate knowledge of embryology without too much expenditure of time and energy, the work will doubtless prove more satisfactory than one of the larger standard text-books.

Extensive bibliographical references follow each chapter, which adds greatly to the value of the work.

GEORGE R. WHITE.

MEDICAL AND SURGICAL REPORT OF THE PRESBYTERIAN HOSPITAL OF THE CITY OF NEW YORK. Vol. v, 1902. Edited by ANDREW J. MCCOSH, M.D., and W. GILMAN THOMPSON, M.D. Octavo. Pp. 284, illustrated. New York: Trow Directory Printing and Bookbinding Company, 1902.

As has been the case with the previous numbers of this series, the fifth volume contains much that is of interest. No attempt has been made to classify the articles presented. The various members of the attending staff have contributed,—in some instances alone, in others in a collaboration with some of their associates. As a rule, the plan has been to represent the cases and the mode of treatment as they actually occurred in the hospital service, rather than a general discussion of the subject which the case represents.

The initial article by M. Allen Starr and Andrew J. McCosh concerns the medical and the surgical history of a patient suffering from a tumor of the brain in the motor zone, which was accurately

localized, and removed by operation. The patient made a good recovery.

The same writers also report a case of tumor of the cauda equina with a successful operation for its removal.

John W. Coe and Burton B. Lee report a series of twenty-two cases of abscess of the brain. Two other contributions to the surgery of the nervous system are "A Case of Dislocation of the Spine at the Sixth Cervical Segment" and "Sarcoma of the External Popliteal Nerve and Its Removal." A case of epidemic cerebrospinal meningitis with unusual skin lesions, reported by Linsly R. Williams, represents the medical aspects of the same group of tissues.

The medical and surgical diseases of the intestinal tract are unusually well represented. Francis P. Kinnicutt, in the second article of the volume, reports five cases of round ulcer of the duodenum which have come under observation in the hospital, and in connection with their histories gives an excellent discussion of this class of cases, and appends an extensive bibliography of the subject.

"Some Unusual Cases of Irreducible Hernia," "Acute Pancreatitis, with the Report of Three Cases," "A Rare Tumor of the Jejunum with Excision and Recovery," "Volvulus following Appendicitis," "Gangrene of the Small Intestine due to Hæmatoma of the Mesentery following Contusion of the Abdomen," and "A Rare Case of Intestinal Obstruction," are titles of other papers relating to the intestinal tract contributed by Eliot, Woolsey, McCosh, Hawkes, and Thacher. Each article, though, as a rule, a short one, is of interest, and, by reason of the stress laid upon pathology and treatment, each is instructive.

Some innovations in surgical technique are described in a well illustrated article upon the catheterization of the ureters, by F. Tilden Brown, and another showing an excellent splint for the treatment of Colles's fracture in extension, by Reginald H. Jackson.

One of the most elaborate and valuable articles of the series is upon "Wandering Kidney and the Results of Operation," by Clarence A. McWilliams. More than sixty cases are reported, details of treatment are given, together with a general discussion of the subject. An excellent monograph is the result.

The department of pathology in this hospital is evidently well equipped. Many of the articles already mentioned show the results of careful work in the pathology of the cases reported; a number of smaller articles deal with hemanalysis, tumor diagnosis and allied topics; but of all the articles in the volume the one that represents the most time, study, and original research is a short tabular statement entitled "The Pathological Conditions found at One Thousand Autopsies," by John S. Thacher. The work of years is here collected, the labor involved in such a number of post-mortems is enormous, and the collecting and tabulating such a series also represents an equal amount of work. In spite of this, it is certain that here, as in other hospitals, the recognition either in the way of scientific reputation or in pecuniary reward is less than that received in any other department of the institution. Professional enthusiasm alone will explain the sacrifice of time, labor, and actual expense which have thus been contributed.

HENRY P. DE FOREST.

TRANSACTIONS OF THE SOUTHERN SURGICAL AND GYNÆCOLOGICAL ASSOCIATION. Vol. xiv. 1902.

This volume of transactions contains a large number of excellent papers. The first paper, by Joseph Price, contends that vaginal puncture or incision for puriform disease or exploratory purposes are unsurgical procedures; and the discussion of the paper shows how widely pelvic surgeons still differ in regard to this question. We regret to observe the absence of judicious middle-ground sentiment.

The paper on the treatment of pelvic and abdominal tumors

complicating pregnancy, by Rufus B. Hall, contains some excellent suggestions.

The report of a case of extra-uterine pregnancy, by H. Tuholske, is one of the most interesting and remarkable in our literature.

In a paper on the closure of the abdominal incision with reference to ventral hernia, by I. S. Stone, appears the statement that the average surgeon has from 8 to 10 per cent. of his incisions become infected. This, in our judgment, is a pretty high percentage of impeachment of the average surgeon; and in all probability the author has included inadvertently some who are not average surgeons.

Thaddeus A. Reamy reports his first abdominal section. This was done in 1864, in the house of the patient, for a large multilocular ovarian cyst. The pedicle was ligated by a heavy cord of shoemaker's linen thread. The author relates how that the hæmorrhage from the area of separated adhesions gave him a good deal of concern. His own language describes best the method adopted by this pioneer of surgery. "What could I do? The vessels were too small and too numerous to ligate, chemical styptics within the abdominal cavity were deemed quite unsafe. I had not the surgical experience nor the common sense to pack with sponges or gauze so as to successfully compress the bleeding surfaces. The weather was cold, with an abundance of clean snow on the ground. I ordered some brought in. Compressing it with my hands into firm balls, it was held against the bleeding surfaces." The patient recovered; and the operator had performed twelve more abdominal sections before he ever saw one done by another operator. In his first thirteen cases he had three deaths. In his last 300 similar cases he has had 2 per cent. mortality. Since this first operation he has made 1600 suprapubic abdominal sections.

The subject of prostatectomy is dealt with in two important papers,—one by Hugh H. Young, of Baltimore, and one by Alex-

ander H. Ferguson, of Chicago. The discussion following these papers shows a wide divergence of opinion.

The paper on penetrating wounds of the abdomen, by E. D. Fenner, involves the statistics of 152 cases operated upon at the Charity Hospital in New Orleans, and reports six new cases. All of these six cases recovered. These tables show 105 cases of gunshot wounds and stab wounds of the abdomen, with visceral injuries, operated upon with a mortality of 70 per cent. The gunshot wounds show a mortality of 73 per cent.

The operative cure of procidentia uteri is discussed by Charles P. Noble. The operation of hepatotomy for biliary obstruction is presented by W. E. B. Davis.

John D. Murphy reports eight cases of prostatectomy, and presents the best argument for the perineal operation.

The chief defect in these transactions appears in the discussions following the papers, which would be greatly improved by a little more vigorous editing. Many of these gentlemen have evidently gotten up and said something because they were invited to do so by the Chair, and not because they felt that they had anything to say.

The whole work is a credit to the Association.

JAMES P. WARBASSE.

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ORIGINAL MEMOIRS.

NEUROFIBROMATOSIS OF THE NERVES OF THE TONGUE (MACROGLOSSIA NEUROFIBRO- MATOSA) AND OF CERTAIN OTHER NERVES OF THE HEAD AND NECK.¹

BY FRANCIS CHARLES ABBOTT, M.S. (Lond.), F.R.C.S.,
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to the Evelina Hospital for Sick Children,

AND

SAMUEL GEORGE SHATTOCK, F.R.C.S.,
OF LONDON,

Joint-Lecturer on Pathology and Curator of Museum, in St. Thomas's Hospital;
Pathological Curator, Royal College of Surgeons.

ALTHOUGH neurofibromatosis, or plexiform fibroma of nerve, is a well-recognized disease, the examples which fall under individual observation are few. In certain situations it is, relatively speaking, not uncommon, but the part most strikingly involved in the present instance, viz., the tongue, is so rare as a site, and the disease so unique in degree, that we are led to report the case in detail.

Clinically, the condition of the tongue falls within the category of macroglossia, but it has nothing in common with the ordinary lymph- or hæm-angiomatous forms of the disease, and should it be included pathologically under the general name of macroglossia, it will need differentiation by some such term as that suggested in the title of this paper.

¹ Read before the Pathological Society of London, October 20, 1902.

CLINICAL DESCRIPTION BY MR. ABBOTT.

History.—D. Q., a female child, four years of age, was admitted into St. Thomas's Hospital in August, 1900. She was born in Somerset to healthy parents, and is the youngest of a family of seven, of whom three others are living, and quite normal, while the remaining three died in infancy.

The only family history of deformity or new growth is in the case of a first cousin of the father, from whom a tumor in the cheek had been removed by operation.

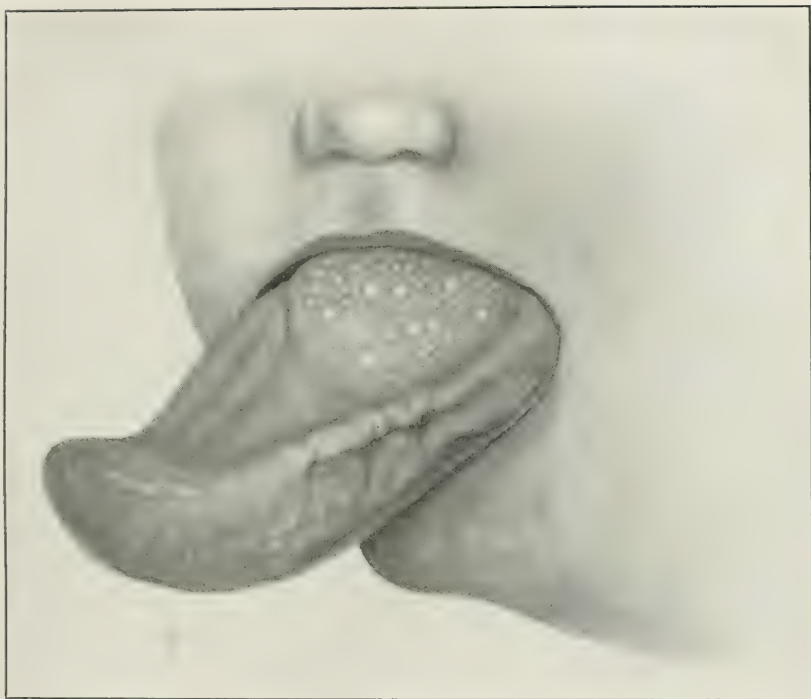
The enlargement of the tongue was first definitely noticed by the doctor who came to vaccinate her when she was two months old. But the mother has an impression that there was something wrong with the tongue when the child was born, and is positive that the peculiar formation of the ear was noticed at birth, while, when the baby cried, the ear and side of the face down to the mouth used to flush and become red, as to a certain extent they still do. The tongue steadily increased in size, and, when the child was one and a half years old, began to protrude from the mouth, which was more and more constantly kept open with the tongue exposed. From this time onward the increase has been constant, and with it the tongue, now nearly always protruded, has turned at its tip upward and to the right. It has sometimes been dry on its surface, but has never given much trouble on this account, the only sore complained of being one by the *frænum*, due to the weight of the organ resting on the lower incisor teeth. The teeth themselves have given no trouble and dentition has been regular.

The child began to talk at the usual age, but, even from the mother's account, has always talked indistinctly from the commencement, though speech has got worse *pari passu* with the enlargement of the tongue. Latterly, for some months before admission, the tongue has nearly always been kept out of the mouth, and, as a rule, the child sleeps with the mouth open and the tongue protruded.

The mother has thought but little of, indeed, has hardly noticed, the fulness of the left side of the face, and cannot say when the swelling in the neck began to be marked, but thinks it has "gradually increased with the rest."

The mother also thinks that, allowing for the general increase

PLATE I.



Surface appearance of the tongue in its natural position.

in size, the deformity of the ear is much as it was at birth, any change having been in the direction of gradual thickening.

State on Admission, August, 1900.—A bright and amusing country child, well developed both physically and mentally.

The *tongue* is greatly enlarged, and is kept throughout the day, and nearly always also when asleep at night, widely protruded from the mouth. It can, however, be withdrawn within the teeth and the mouth properly closed, and this the child will do whenever told to do so, but is not so happy in this state. This withdrawal of the tongue is managed by a peculiar rolling movement upward and to the right, the tip resting against the right side of the palate, and the main part of the enlargement lying behind and to the left. This movement she aids by throwing her head backward, as if swallowing a pill. On closer examination, the enlargement of the tongue is seen to belong entirely to the left side of the organ, and to be strictly limited by the median raphe. The enlargement of the left side is in all three dimensions. The right half is stretched out along the raphe, and therefore appears narrower and smaller than normal. Owing to the tension of this normal half, the raphe forms a bow curve, the concavity of which is to the right and ends on the right side of the organ some way behind the tip, the whole of the much enlarged and thickened tip being formed by the left side.

Owing, also, to this tension, the tip is curled sharply upward, so that just behind it there is a deep concavity on the dorsum, bounded by the thickened free edge of the left side of the tongue. Behind this concavity comes the prominence due to the local swelling to be afterwards mentioned, so that the upper surface, as a whole, is convexo-concavo-convex from before backward. The enlargement of the left side extends back as far, possibly even farther, than the circumvallate papillæ. The consistence is tough and firm, and when pinched it feels coarsely granular, while some cord-like structures can also be felt in it. Towards the posterior part is a fairly definitely circumscribed "tumor," shaped like a flat almond, with its long axis forward and outward. It is about an inch in length, and extends from the median raphe to the left border of the tongue. Posteriorly it reaches back to the circumvallate papillæ, and about two-thirds of it are protruded from the mouth in the natural position of the tongue. Though it presents a definite outline on the left border of the tongue, it is more

plainly circumscribed on the dorsal surface, and it is in the mucous membrane covering this that the changes in the fungiform papillæ are especially conspicuous.

The *mucous membrane* covering it is dry, thickened, and opaque, in places forming dull white patches. But the dryness is not so extreme as would be expected, and the general impression is one of coarsening.

The mucous membrane on the under surface is thickened and patchy, but on the whole smooth. There are, however, some deep folds along the free edge and extending downward from this.

The glands along the free edge are conspicuous, especially towards the tip. On the dorsum, the whole surface looks tough, granular, and coarse; this change being more marked posteriorly, especially over the local prominence due to the circumscribed tumor. This results from a very marked enlargement, both in diameter and height, of the fungiform papillæ, which form conspicuous objects. They are paler than natural, owing to the thickening of the corium over them. The impression clinically was that the conical papillæ were also enlarged, and they were certainly more distinct than usual.

The ranine vein was conspicuous on the under surface of the tongue. No vesicles, containing either clear fluid or blood, could be seen on any part of the surface.

The *face*, *palate*, and *fauces* were normal. There was a vague, diffuse fulness of the whole of the left side of the face, practically obliterating the lines, and diminishing the expression on this side. This was most marked on the cheek between the eye and the mouth, but could also be made out in a partial obliteration of the frontal furrows.

The mucous membrane of the lips showed a similar unilateral thickening to a slight degree.

The *neck*. This fulness extended over the ramus of the jaw, and became much more marked in the submaxillary triangle and upper part of the neck. Here it formed a conspicuous swelling extending from the mid-line back to the anterior border of the sternomastoid and downward to the level of the hyoid bone. Whereas on the face no structures could be differentiated in the swelling, in the neck it consisted of lumps and knotted cords of considerable size plainly to be felt through the skin. Nothing abnormal was noticed in the neck or side of body below this level.

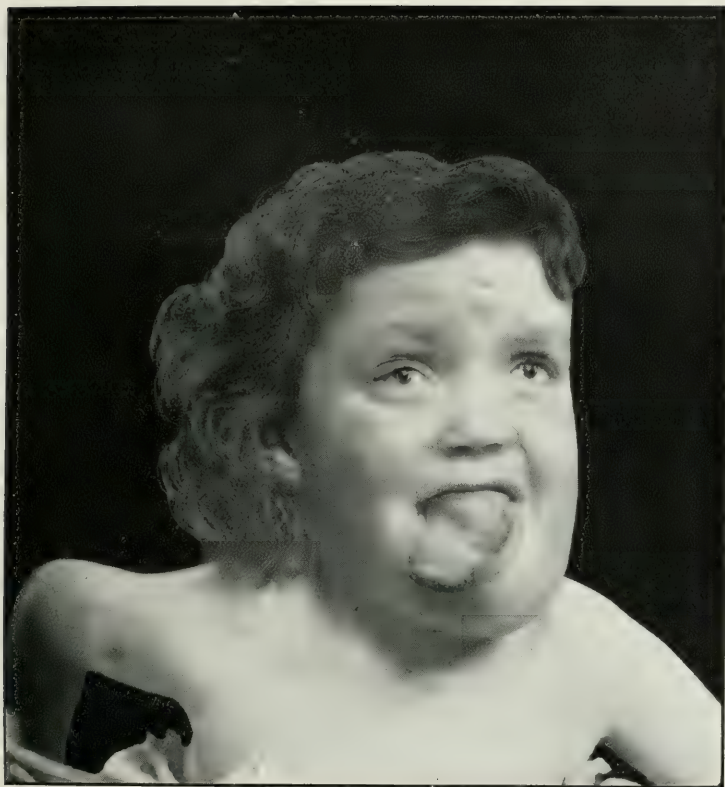


FIG. 1.—Front view of child, with tongue as habitually protruded



FIG. 2.—Side view of child, with tongue as habitually protruded.

The *ear* presented similar changes to those in the face in a marked degree. The left ear was obviously larger and thicker built than its fellow, and its long axis was increased by half an inch. This thickening involved the whole of the rim of the helix and the lower part of the antihelix and antitragus to a less extent. It was, however, most marked in the extension of the fore part of the helix across the cavity of the concha, which cavity was largely filled up by a smooth-covered mass shaped like the pulp of a finger. All these enlargements seemed due to thickening of the skin and not of the cartilage, and the skin on the posterior surface of pinna was also coarse.

The whole of these changes were strictly unilateral.

The child was mentally bright, and fond of chattering to any one who had her confidence, but seemed conscious of the badness of her speech before strangers. The words were thick and badly formed, but it was quite possible to understand what she said. There was a good deal of dribbling of saliva from the angles of the mouth, especially during sleep. She nearly always slept with the tongue protruded and snored a good deal. There was no difficulty in taking ordinary food. The hearing was not affected by the malformation of the auricle.

Whenever the child cried or got in a temper, a definite slight, but bright, unilateral flush suffused the whole affected side of the face. This the mother had noticed from early infancy. It was not accompanied by unilateral sweating.

Operation, September 5, 1900.—Under chloroform the tongue was divided by scissors along the raphe, but in one or two places, especially along the side of the definite growth, the incision entered the left side of the tongue.

The tongue was then freed from its attachments to the floor of the mouth and drawn forward, when a second division was made from the left free border, backward and inward, to join the posterior end of the first incision. This incision was planned so that the length of cut surface exposed should correspond to and fit the raw surface of the raphe. It was intended to pass entirely behind the growth, but a small portion of the posterior edge of the circumscribed growth was left behind, and from this the present recurrence has commenced. The circumvallate papillæ were not removed. The corium was thick and tough to cut. The tongue substance was firm and bled very little, and the cut surface

showed numerous convoluted and partially opaque white cords between and also apparently among the muscles. The cut surface left behind on the left side showed a similar structure.

The only vessel of any importance needing ligature was the ranine, and there was no extensive capillary oozing, as is usual in ordinary macroglossia. The two cut surfaces were now sutured together on the dorsal surface, and as far as possible below as well.

Owing to the rigidity of the remaining part of the left side of the tongue, the new raphe and tip were strongly curled over to the left side of the mouth.

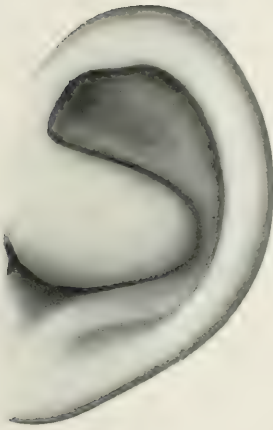
After the operation the temperature continued quite normal. A few small surface sloughs formed, and had to separate on under side of tongue, but all was soundly healed when the stitches were removed on the ninth day.

For a few days there was some difficulty in feeding the child, but never any with her breathing.

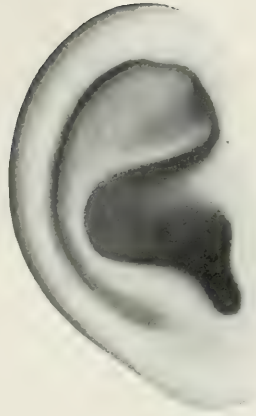
Within a fortnight she could talk again, and her power of articulation was about the same as on admission, the words being indistinct, but understandable by any one who took the trouble.

On September 26 a second operation was undertaken, with the object of reducing the swelling beneath the jaw, which now formed by far the most conspicuous deformity. A large curved incision was made from the mid-line below the jaw, passing as low as the cornu of the hyoid bone, and then backward and upward to anterior border of sternomastoid in line with the horizontal ramus. This flap was dissected up, and a curious condition exposed. The swelling consisted of worm-like coils of semitransparent white cords, inextricably twisted, and with knots in places. These cords varied much in size, from extremely small and thread-like ones to others the size of a No. 3 catheter. This condition invaded all the anatomical structures of the part, even the platysma, and rendered their differentiation difficult. The two bellies of the digastric were made out and were also involved.

This tissue was cleared entirely from the submaxillary triangle, the removal including certainly the superficial part of the submaxillary salivary gland and lymphatic glands. Posteriorly the removal was carried rather high behind the ascending ramus, beneath the upper angle of the incision, and it was here doubtless that the damage to the facial nerve occurred.



The left ear.



The right ear, normal.

FIG. 3.

There was again very little bleeding, and the wound was entirely closed with horsehair sutures.

On the second day after operation there was marked increase in the swelling of the left side of the face, which became almost tense. At the same time left facial paralysis was first noticed, apparently complete of the lower part of the face, but not above, as the left eye could be closed, and was always closed when the child was asleep.

The wound was dressed for the first time on the seventh day and the stitches removed. The temperature had throughout been normal. The wound was tapped with a director and a considerable quantity of clear serum escaped. This continued to escape in considerable quantity till the wound finally closed on October 12.

With a view to diminish the facial swelling, massage of the cheek was begun a few days after operation, and continued for a few minutes each day. But this swelling did not materially decrease before the child left the hospital on November 9, while the effects of the facial paralysis became more obvious.

Facial nerve. Dr. Turney, who kindly twice examined the child in the electrical department, made the following reports:

October 11. "Left facial nerve. No reaction to faradic current. To galvanic current no reaction either, but this was not carried far for fear of upsetting the child."

November 1. "No faradic irritability in either division of left facial. It must be remembered, however, that it is impossible to use strong currents. At all events, there is no sign of repair so far."

The child left the hospital on November 9 with a small battery to be used at home. She was very well in herself, the tongue lay entirely in the mouth and was nearly symmetrical, and articulation was quite as good as before operation. The appearance of the neck was greatly improved, but the facial paralysis with the fulness of the left side of the face still made an unsightly spectacle.

Through the kindness of Dr. Allden, of Bridport, we heard several times of the progress of the child, but did not see her again till readmitted for examination in the summer of this year. Her health in the meantime had been good; some power had returned in the face, the improvement being most marked in the last six months and her articulation had much improved. For

some time after her discharge the face had continued swollen and tense. This at first improved gradually, and the improvement had recently been more rapid. The tongue first pained her again in the summer of 1901, and the return of the lump in it was noticed then. The mother thinks that it varies in prominence, but on the whole gets larger. She used to snore badly at night, but never does so now.

Condition on May 6, 1902.—The child in herself is healthy.

The *tongue* now lies entirely in the mouth, which is naturally kept shut. It moves freely and is fairly symmetrical. There is a slight tie due to scar tissue beneath it, so that when told to protrude it, the dorsum rises in a convexity.

The raphe still passes over somewhat to the left to the new tip, but has largely resumed its median position. There is a recurrence of the tumor formation the size of a small almond. This has evidently arisen from the small portion of the circumscribed tumor left behind at the first operation. It therefore lies close to the raphe, and not quite an inch from the new tip. The mucous membrane over it presents the same characters, with the enlarged papillæ, as before. There is no trace of enlargement in the right side.

Several attempts were made to test the sense of taste, but, owing to the youth of the patient, failed. Tactile sense appears normal.

The palate and fauces remain normal. There is no atrophy or want of development of alveolus, and two permanent incisors are in position, while the jaws meet normally.

The *face*. The swelling of the face that occurred after the second (neck) operation has entirely disappeared, and the face is now much in the same state of slight general fulness as when the child was first seen. The flushes when she cries still take place unilaterally, but are less marked.

The *facial paralysis* has much improved. The left eye can be shut and even partially be screwed up, and is normally closed during sleep. There is also less asymmetry about the mouth.

The actual nerve condition was examined by Dr. Turney, who reports, "Left facial. Orbicularis oculi acts well. Orbicularis oris requires strong currents, but contraction is quite distinct. Considering the long history, however, I should consider any further improvement very doubtful, but it is quite possible."



FIG. 4.—Front view, two years after operation, showing amount of recovery of function of facial nerve.



FIG. 5.—Side view, two years after operation, showing present condition of ear, face, and neck.



FIG. 6.—Dissection of part of tongue removed.



FIG. 7.—Neurofibromatosis of tongue, low power, showing the enlarged nerves among the bundle of muscle fibres.

The *ear* is much as when last seen, but the thickening has slightly increased, especially of the antitragus. No nerves can be felt on either surface of the auricle.

The *neck*. The scar is sound, and contracted below the jaw. There is no return of the knotted tortuous cords in the area of operation, but these can be easily felt around this area, and extend in various directions.

On careful examination, they can be detected in and as far as the following positions:

(1) Close to the mid-line of the neck in front of the sternomastoid muscle.

(2) Down to the second piece of the sternum.

(3) Over the whole area of the posterior triangle and crossing the clavicle.

(4) Beneath the skin over the mastoid process and above and behind the pinna.

In no instance do they cross the mid-line of the body, even in the tongue and submaxillary region.

PATHOLOGICAL ACCOUNT BY MR. SHATTOCK.

The specimen figured is the left half of the tongue, showing in a highly pronounced degree the condition of fibromatosis of the nerves or plexiform neurofibroma. Every nerve, as shown by dissection, is enlarged from the disease, even to those terminating in the divided mucosa along the lower side of the organ. The nerve most enlarged, the trunk of the lingual, measures .5 centimetre in diameter. All the nerves are markedly increased in length as well as in thickness so as to lie in serpentine or short transverse folds, with the result that in many situations a compact plexus has been produced. Towards the middle line of the organ such a plexus quite exceeds the distal portion of the enlarged trunk already referred to.

In the divided posterior surface the muscular substance is hardly recognizable in consequence of the universal enlargement of the nerves lying in it. The papillæ are increased in size so as to give the surface an abnormally coarse appearance; this is especially marked over the posterior part, in the situation of the chief swelling which is such as to render the general dorsum concave in place of convex; some of the fungiform series measure as much as three millimetres in horizontal diameter. The morbid

condition did not extend into the right half of the organ; and the same asymmetry was apparent in the neck, the right side of which was free of disease, whilst in the left there were extensive neurofibromatous swellings to be later detailed.

Histology.—Sections carried transversely through the base of the portion of the tongue removed show that the enlarged nerves constitute by far the chief part of the sectioned area, the bundles of muscle fibre being widely disparted between them. The enlargement of the tongue is due solely to the lesion of the nerves, the intervening muscular and connective tissues being compressed without trace of œdema or of lymph- or hæm-angiectasis. The nerves are enlarged throughout the section, even in the conical and fungiform papillæ, and present in places figures of abnormal complexity due to an unnatural tortuosity brought about by their elongation. The increase is the result of a diffuse formation of connective tissue of loose or open texture peripherally, but of closer centrally, where the enlarged nerve presents a denser core in which here and there a medullated nerve fibre is recognizable.

Each of the enlarged nerves is circumscribed by a lamellar sheath. The looser new-formed fibrous tissue is resolvable into ill-defined bundles of delicate wavy fibres, which subdivide to fill the intervening space with a widely open irregular mesh of finer fibres or single fibrils; and the tissue is provided with a considerable number of corpuscles of the ordinary connective kind. In cross section the bundles appear, naturally, as collections of polyhedral points like those of the endoneurium from which the new tissue has obviously arisen. Unna's acid orcein stain showed a complete absence of elastic fibre in the enlarged nerves. In certain of the enlargements nerve-cells are present,—i.e., sphe-roidal cells of large size with deeply stained violet body (hæmatoxylin and eosin), a spherical nucleus of conspicuous size, and holding well pronounced nucleolus. Here and there such nerve-cells occur closely set in small groups within the enlarged nerve, each cell being provided with a multinuclear sheath: some such cells lie in the nerves of the mucosa, others, in those deeply placed. The occurrence of these cells may be taken as proving the involvement of the glossopharyngeal nerve (in addition to the lingual and hypoglossal), since microscopic ganglia normally exist upon the expansions of this nerve in the human subject. With the left half of the tongue there was removed, in two pieces, a mass from



FIG. 8.—Dissection of parts removed from the neck.

the left side of the neck. Each of these pieces admits on dissection of being resolved into a plexus of enlarged, elongated, and tortuous nerves. In connection with the larger, lower, of the two a considerable part of the superficial portion of the submaxillary gland was removed, together with a small extent of the platysma muscle.

The nerves over the platysma, like all the rest, are thickened and tortuous, those distributed to it ramifying like gnarled roots among its fibres. The submaxillary gland is intimately connected with the diseased nerves, many of which penetrate it, and render its lobules unnaturally firm in consistence. The upper of the two masses from the neck has precisely the same general characters, and it likewise comprises a small portion of the submaxillary gland, which as a whole appears abnormal in volume, a result to be ascribed to the enlargement of the nerves which pass through or supply it.

Microscopic examination of the gland reveals the fact that the pertaining nerves are as universally involved as those of the tongue.

REMARKS BY THE AUTHORS.

In the tongue the involvement of the nerves, though universal, is not uniform in degree, as appears from the eminence on the posterior part of the organ removed, which is such as to render the dorsum concave in place of convex. It is noteworthy that it is over this eminence that the papillæ are especially enlarged. The enlargement of the papillæ is in part due to the fibromatosis of the nerves within them, in part to an increase of the general connective tissue, but in no instance do they present lymphangiectatic or hæmangiectatic spaces as in the common forms of macroglossia. When compared with sections of the normal child's tongue, it is obvious that the corium of the mucous membrane in general is notably richer in connective-tissue cells and that its fibre has no longer the coarse fascicular normal character, but is more finely textured than natural, an overgrowth of a highly cellular new connective tissue having taken place precisely like that which is encountered in cases of neurofibromatous pachydermatocele.

If we turn to Robert Smith's work ("Pathology, Diagnosis, and Treatment of Neuroma," Dublin, 1849), we find the tongue to have been involved in the first of the two cases with which the

illustrations of the monograph deal. Besides the multiple fibromata on the nerves of the limbs and elsewhere, there existed on the under surface of the tongue nearly twenty tumors, varying in size from a hempseed to a walnut, and connected with the left hypoglossal.

Virchow, in his incomparable work (Lecture 24) refers to the example recorded by Colin in a cow (*Recueil de Méd. Vétér.*, Série IV, t. viii, p. 947); here there were tumors on various of the nerves, including those of the tongue.

These, however, are examples of multiple neurofibroma, rather than of the diffuse growth of connective tissue characterizing neurofibromatosis.

The case which seems to approach nearest to the present is one referred to by Alexis Thomson ("Neuroma and Neurofibromatosis," 1900), in which Bobrow observed in a boy, ten years of age, a plexiform tumor of the left side of the head and occiput, associated with left-sided macroglossia. Here it is not improbable that the macroglossia was of the kind described in the present communication, *i.e.*, neurofibromatous, although it was taken to be of the common lymphatic type as appears from its being discussed under the heading of the simultaneous occurrence of *other* defects of developmental origin with neurofibromatosis.

It seems to us best to place this case among the varieties of macroglossia, with the distinctive name of macroglossia neurofibromatosa, although in so doing we give weight to only one of the organs affected by the condition.

But this organ, the tongue, formed at first the prominent feature of the case, and was the sole trouble for which the child came under treatment. In ordinary macroglossia of lymph- or blood-vascular origin, moreover, it is not uncommon for the condition to extend beyond the limits of the tongue, for vesicles to be present on the mucous membrane of the mouth, and even for lymphatic cysts to be found in the submaxillary region and neck. As an example of diffuse neurofibromatosis of the nerves of the head, neck, and tongue, it is unique in its extent, and in the number of the nerves involved in this situation.

From the condition seen at the two operations, the examination of the parts removed, and the recent re-examination of the patient, we can enumerate the following nerves as having been implicated, viz. :

Among motor nerves, the hypoglossal, facial, and motor branch of the third division of the fifth nerve.

Among sensory nerves, the glossopharyngeal, the lingual and auriculotemporal branches of the third division of the fifth nerve, and the transverse cervical, suprasternal and supraclavicular descending branches of the cervical plexus.

Probably, also, the other two divisions of the fifth nerve and the small occipital and great auricular branches of the cervical plexus were involved as well.

Though we have no anatomical evidence in support of this view, the undoubted disturbance of function in the left cervical sympathetic, as shown by the unilateral flushings referred to above, hints at some possibly similar change in it.

From the clinical stand-point the case was a puzzle, and the true condition was not even suspected till after operation, and examination of the parts removed. The tongue itself closely resembled the organ in cases of the tough fibrous form of macroglossia of lymphatic origin.

Its special features were the strict limitation to one side of the organ and the more circumscribed "tumor" in addition to the diffuse new formation. Besides these were the marked enlargement of the fungiform papillæ, and the entire absence of vesicles or any signs of dilated lymph or blood spaces.

Almost the only clinical feature to excite suspicion in the tongue itself was its granular feel and the cord-like structures in its substance. The smooth solid thickening of the face and ear was explained as due to congenital blocking of the lymphatics of the neck, while the nodular and cord-like masses in this latter situation were thought to be maldevelopments of the same system. These formed the most unusual clinical features of the case, and should in a similar one lead to a correct diagnosis of the true pathological condition.

The clinical condition in the neck exactly resembled that described in other cases of neurofibromatosis.

In some cases also, covering the definite masses of neurofibroma, is a smooth thickening of the skin and subcutaneous tissue as was present in our case, in its true characters representing a diffuse molluscum fibrosum, and corresponding to the multiple soft fibromata of Recklinghausen's disease.

Was the general thickening of the side of the face and the enlargement of the ear of similar origin? We believe this to be the correct explanation, and it would best account for the inequalities of its distribution, and the almost localized "tumor" made by this condition across the concha of the ear. It is true that no changes in the nerve cords of this area could be felt, but neither can they be in Recklinghausen's disease.

Another possible explanation must be borne in mind, the possibility of the thickening being due to some trophic change, and connected with the unilateral flushings and vasomotor disturbance acting from infancy, and possibly from foetal life. We do not see how to explain these flushings except as due to some involvement of the cervical sympathetic. This nerve may very probably have been involved with the others on this side of the neck, but the explanation needs the further large assumption that the diffuse neurofibroma causes interference with nerve function, of which there is no proof in the case of motor or sensory nerves, certainly none in the present case.

With this explanation in view, the child was examined for unilateral sweating, for changes in the pupil or in the vessels of the fundus, and for abnormal growth of hair as would be shown in the eyebrow, but in every instance with a negative result. Nor would this theory satisfy the almost local tumor formation in the ear, and we discard it for the other hypothesis.

The facial paralysis which resulted immediately from the second operation was no doubt due to the plexiform fibroma removed from the neck, having been largely of the facial nerve after it had broken up into its main divisions.

It must have been impossible from the incision made to

reach the normal course of the branches of the temporofacial. But so tortuous does the dissection prove the nerves to have become, that many of these branches may have bent down in their course and so have been divided. The extent of the paralysis that followed the operation is confirmation of the wide involvement of the facial nerve, even to its upper branches. The involvement of the cervicofacial was seen at the second operation, and can be demonstrated in the specimen of the parts removed from the neck.

REPORT OF SIXTY CASES OF ACTINOMYCOSIS.¹

BY PROFESSOR R. VON BARACZ,

OF LEMBERG, AUSTRIA.

I HAVE chosen human actinomycosis as the subject of the present communication for two reasons: (1) Because this disease is of rarer occurrence in this country than abroad; (2) because I have made a special study of it, having had occasion during the last fourteen years to observe it in sixty cases; therefore, more than any clinic in Europe. The reason of its frequency in Galicia is the extensive farming in that country.

It is not my intention to speak broadly of its etiology, pathology, clinical course, and treatment. I shall only deal with some points which are doubtful and less clear, and which I shall strive to elucidate by my personal observation.

As to the seat of the disease, I have had fifty-two cases of actinomycosis of the jaw and neck, three of the tongue, three of the thorax and lungs, and two of the abdomen. As to the abdominal form, I have had occasion to observe three more cases in the practice of some of my colleagues, so that I observed altogether five abdominal cases.

Actinomycosis is produced solely by a special form of fungus, the streptothrix actinomycotica. This fungus usually enters the body through the mucous membrane of the mouth, of the air passages, or of the digestive tract. Very rarely it enters through the skin. The transmittents of the disease are exclusively minute vegetable bodies, as the awns of barley and grass particles. The proof of this is the frequent finding of these bodies in actinomycotic abscesses. The teeth are never the portal of entrance. The cases cited by Murphy, Partsch, and others, in which a communication between the abscesses of the soft parts and the alveolus was found, or in which a

¹ Read before the Chicago Surgical Society, December 1, 1902.

fungus was found in a decayed tooth, are not sufficient proof that the disease gained entrance through the decayed tooth. The evidence of the incorrectness of this route of entrance is the lack of decayed teeth in actinomycotic cattle, and sometimes in human subjects; the impossibility of finding the fungus in decayed teeth, and the frequent finding of the fungus in the soft parts of the cheeks. I have myself detected such vegetable bodies in thirteen cases of cheek and tongue actinomycosis, but never in decayed teeth; in these I only found the *leptothrix buccalis*.

Decayed teeth play an important rôle in the etiology of the disease, as the softened and swollen gums allow of an easy entrance of the fungus with a foreign body. The fungus rarely develops in the mucous membrane of the mouth itself. It wanders towards the surface of the body, and develops either in the region of the angle of the lower jaw or lower in the neck. If we carefully observe cases of neck actinomycosis, we will be convinced of its buccal origin. Allow me to cite a case.

A young man had eaten some apples on Christmas-eve—apples which were packed in straw. He felt that something had pricked his gum behind the wisdom tooth. A few days later he was unable to open his mouth as well as before, and later on a nodule developed below the angle of the jaw, and the jaw stiffness subsided. Some weeks later I saw him with an actinomycotic lump in the lower part of his neck, which softened and gave rise to long-continued ulceration. I found a particle of straw in the abscess cavity, which in all probability had entered his gum while eating the apple.

Bones are never primarily attacked in actinomycosis of the jaws, either in man or animal. The central bone forms of Poncet do not exist. Tumor-like forms do occur in the lower jaw and neck, but rarely. I have observed two cases; in one the diagnosis was made after the enucleation of the tumor.

Treatment.—My method of treatment in the first forty cases was operative. It consisted of curettement and extraction of teeth. As the disease generally produces a hard wall around the softened area, and this wall hinders the extension of the

process, I attempted in several cases to produce such a wall, which consists of connective tissue, by hypodermic injections of irritants like tincture of iodine, and 20 per cent. solution of silver nitrate. In this manner I was able to cure my last nine cases without any operative interference. Nitrate of silver in sticks, or in 20 per cent. solution, not only produces such boundary of connective tissue, but kills the fungus.

Tongue actinomycosis occurs in the form of circumscribed or diffuse abscesses. In three cases of tongue actinomycosis I found vegetable bodies in softened tissues. They were cured by opening and curettement.

In actinomycosis of the thorax and lungs the prognosis is very unfavorable. Three of my cases have died. The fungus enters here by the air passages or the œsophagus. In one case I found at the necropsy a fistula between the œsophagus and the posterior mediastinum. These cases are not suitable for surgical treatment, because we cannot reach the deep foci in the lungs and in the prevertebral region. The few reported cases of lung actinomycosis must be considered with great reserve because of the short time for observation after the operation. In my opinion, the only way of dealing with these cases is by so-called blood antisepsis, the method first introduced by Girido Bacelli for the cure of syphilis, and later advised by Credé in cases of septic pyæmia, namely, the intravenous injection of colloid silver (collargol). We already know of the great value of nitrate of silver in actinomycosis. Knowing, however, that nitrate of silver coagulates blood, we must choose some substitute for it. In order to convince myself if the animal organisms can tolerate such blood antisepsis, I have attempted intravenous injections of the various soluble preparations of silver in a number of dogs and rabbits. For this purpose I used one to two per cent. solutions of argonin, argentamin, largin, ichthangan, and soluble colloid silver (collargol) in increasing doses, and the last proved the best, even in comparatively large doses, according to the body weight of the animals. I observed no unpleasant symptoms.

I will endeavor to speak of my method of procedure at

another time. I believe that intravenous injections of collargol in actinomycosis of the lung and thorax will be of great service.

In abdominal actinomycosis the fungus also enters the system through the mucous membrane of the alimentary tract with vegetable bodies, which usually lodge in the region of the cæcum or vermiform appendix. Several cases are reported in literature in which vegetable bodies were found in perityphlitic abscesses. In a case related by Boström the awn of barley was found in an ovarian abscess, but this ovary adhered to the vermiform appendix. In these cases of abdominal actinomycosis the prognosis is good only if the disease is limited; if, however, the prevertebral tissue, the liver, or the portal vein become involved, the prognosis is very bad, because then we can easily have metastases; and if mixed infection supervenes, a septic pyæmia results. Two of my abdominal cases were cured, one of these (perityphlitic actinomycosis) by the introduction of nitrate of silver sticks into the focus.

As far as the fungus itself is concerned, I came to the conclusion through personal observation that there is only one form of the fungus which produces actinomycosis. This view of mine is contrary to the assertion of Beresteff, who claims to have discovered many forms of the fungus. Some authors require cultures for a positive diagnosis of actinomycosis, but I believe this to be unnecessary, often impossible, and thus many cases would be unrecognized. The fungus can be very easily discovered microscopically, and it is often possible to diagnose the disease macroscopically with some degree of certainty.

The characteristic appearance of the fungus macroscopically is that of minute grains, the size of a poppy-seed, or smaller, of a lemon-yellow color, hard, so they can be crushed only by some pressure of the cover-glass upon the slide. Microscopically, the fungus consists of the following parts: (1) The clubs; (2) the mycelium threads, and (3) large quantities of small bodies like micrococci. The clubs may be absent, but never the mycelium threads or the small bodies. The mycelium threads are very thin, are dichotomically branched, and have

some small clubs on their extremities. They consist of a sheath and very minute bodies, similar to those in the meshes. These bodies are the spores, as proved by Boström. The threads are best stained by Gram's method. The clubs may be stained only in sections by fuchsin or eosin. Hæmatoxylin is a good counter-stain. The mycelium threads, with the small bodies in the meshes, are sufficient for diagnosis. The single fungi form colonies. Grains without clubs form the youngest stages of development. Where the clubs are present, fungus is mature. This may be proved by studying the fungus in the different stages of the disease. There are some anomalous forms of the fungus in which, besides the normal threads, there are some very thick threads, which probably are degenerative changes of the sheath of the threads.

The cultures of these grains do not always succeed. In some cases I succeeded in obtaining cultures in all known ordinary media, and raw eggs, but only with the exclusion of oxygen (anaërobe).

As to animal inoculation, I tried it in mice, pigeons, hens, dogs, and rabbits. In mice, pigeons, and hens the fresh grains were introduced under the skin, but they disappeared entirely after some weeks. In dogs the grains were inoculated into the peritoneum, and they also disappeared. Only in a few rabbits the inoculation resulted in tumor-formation after six weeks. The tumors were examined microscopically, and proved to be only irritative changes, as produced by other foreign bodies. We see in the specimens the formation of epithelioid cells surrounded by lymphoids, a view shown in encapsulation of foreign bodies.

I must thoroughly agree with Boström that animal inoculation is not successful in actinomycosis.

EXTRADURAL HÆMORRHAGE FROM RUPTURE OF THE MIDDLE MENINGEAL ARTERY.¹

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My object in this contribution is to report two cases of rupture of the middle meningeal artery and compression of the brain by an extradural clot, with operation and recovery, and a third case in which the symptoms closely simulated those of extradural hæmorrhage, but in which operation showed it to be absent. These cases all came under my observation in a short space of time, and, as I had previously encountered but two similar cases in my own experience, I thought they might be of sufficient interest to make this report.

CASE I.—*Fracture of Skull; Extradural Hæmorrhage from Rupture of Middle Meningeal Artery; Fracture of Tibia and Fibula; Lacerated Wounds of Face, Mouth, and Scalp.*

W. C., white, aged nine years, was admitted to the Children's Hospital, April 22, 1902, with a history of having a short time before fallen from a freight-car on which he was playing. When admitted he was conscious, but somewhat irrational, and was still suffering from shock. His temperature was 98° F.; pulse, 92, but of rather poor volume. He was bleeding freely from a wound in the chin about two inches long, which communicated with the mouth. The upper lip was torn from the gum and superior maxilla, almost opening the nasal cavity, and the left cheek was cut internally by impaction against the teeth, two of which were broken. There was a slight lacerated wound of the scalp in the posterior parietal region on the right side, not extending to the bone, and around and above it a considerable hæmatoma. Palpation in this region gave a distinct sense of depression in the underlying bone. The left tibia and fibula were fractured transversely

¹ Read before the Philadelphia Academy of Surgery, November 3, 1902.

in their lower third, and the lower fragments and foot were drawn backward at a considerable angle by the action of the calf muscles. There was no paralysis of face or limbs; the pupils were equally contracted. He vomited freely after admission. The boy was etherized, and the fracture of the leg reduced, the tendo Achillis being divided subcutaneously to facilitate reduction and prevent subsequent deformity; and the foot, leg, and knee fixed with double lateral splints of binder's-board and placed in a fracture-box. The wounds in the face and mouth were sutured. A diagnosis of probable fracture of the skull was made, but, as the depression seemed moderate and the symptoms rather those of concussion with shock than compression, surgical interference was postponed. The patient reacted well from the shock, pulse dropping from 120 on the evening of the 22d to 76 the following evening, but the temperature remained slightly elevated, ranging from 100° to 101 $\frac{3}{5}$ ° F., and his mental condition being dull during the day and somewhat delirious at night. He was roused with difficulty. The pupils were equal and contracted; there was no paralysis. He vomited a couple of times on the 25th and 26th. The hæmatoma over the right parietal region continued to increase in size. While there were distinct evidences of cerebral irritation, it was difficult to separate them from those naturally due to the shock and concussion, complicated as they were by his other injuries.

On the evening of the 26th, however, after a bad night and day, his pulse suddenly dropped to 48, and operation was at once decided upon. Dr. Wharton, who had seen him several times with me, assisted me. Incision evacuated the contents of a large hæmatoma in the parietal region, and revealed a moderate depression above and behind the right ear about three-fourths of an inch in diameter; and running from this, parallel to the median line, was a fissure several inches in length crossing the parietal and penetrating the frontal bone. An extradural clot presented itself after removal of a fragment of the depressed area, which it filled, and from which it extended forward. It was gradually uncovered by cutting away the bone on either side of the fissure with rongeur forceps, until its anterior limit was reached about four inches in front, where the middle meningeal artery had been torn. The clot was about three-fourths of an inch thick and about two and one-half inches wide. After removal, there was free

hæmorrhage from the region of the vessel, which was only checked by packing with gauze strips, as the bleeding vessel could not be isolated. The brain was much depressed by the very large clot, but the dura was uninjured. The packing was brought out at the anterior portion of the wound, a gauze strip laid in the posterior angle, and the remainder of the wound sutured. The patient was slightly shocked, but soon rallied. The next day his pulse varied from 92 to 100, and temperature fell from $101\frac{2}{3}^{\circ}$ to $100\frac{3}{4}^{\circ}$ F. His mental condition at once began to improve. The restlessness and delirium abated, and while he was very dull and slept a great deal for several days, he was easily roused, and at the end of this time regained fully the possession of his mental faculties. No paralysis was present at any time before or after the operation. On May 1 he was again etherized and the packing removed. There had been considerable oozing after operation, and there was some fresh bleeding from the region of the vessel, which was controlled by a little packing, which was removed three days later. The greater part of the wound healed by first intention. The temperature remained slightly elevated for a week, between 100° and $100\frac{1}{2}^{\circ}$ F.; but his condition gave us no anxiety after the operation, and his convalescence was uneventful. Medication consisted in calomel one-tenth grain every three hours, with bromides for restlessness, and strychnine after operation.

CASE II.—*Contusion of Head; Rupture of Middle Meningeal Artery; Extradural Hæmorrhage; No Fracture of Skull.*

D. C., aged thirty-three years, Italian, was admitted to the Presbyterian Hospital, July 1, 1902, at 5.30 P.M. He had been struck on the left side of the head by a piece of cable, from the breaking of a derrick that morning, knocked down and stunned. He either did not lose or soon regained consciousness, and refused to go to the hospital, but did not resume work, walking with assistance to a shanty near where he was employed. In the afternoon, several hours later, he became unconscious, and was hurried in the patrol to the hospital. He was admitted in an unconscious condition. There was a contusion, with an underlying hæmatoma and two slight superficial lacerations of the scalp about four fingers'-breadth behind the left eye and a similar distance above the zygoma. The temperature was 96° F., pulse 48, respiration 24 and irregular. The pupils reacted to light. There was a slight protrusion of the left eyeball and œdema of the lid on same side.

The face was not noticeably drawn. During examination he resisted with the left arm only, although he was able to make indefinite movements with the right arm and to move both legs. There was a very distinct partial paresis of the right side. He made no attempt to speak and seemed to recognize no one. I saw him at 8 P.M. Coma was now more profound. The pupils were fixed midway between contraction and dilatation, the left slightly larger than the right; neither reacted at all to light. Temperature $98\frac{2}{5}^{\circ}$ F., pulse 68, respiration 20. No movements of extremities at all. Condition otherwise as given above. There was a sense of depression in the left parietal region, which led me to think we would find a fracture. The patient was at once prepared for operation and ether was found necessary. During preparation he moved the right arm and leg a little, showing paralysis was not complete. A semicircular flap was reflected over the contused area on the left side and the bone exposed, covered by a hæmatoma of external origin. No fracture was discovered. I had been led by his history and symptoms to suspect a rupture of the middle meningeal artery, and when I found no fracture, determined to trephine over its location and examine it. The incision was enlarged anteriorly, and the crown of a medium-sized trephine applied, with the pin over a point two fingers'-breadth behind the external angular process of the frontal bone, and three fingers'-breadth above the zygoma. The button removed was grooved by the vessel, which was bleeding in its immediate neighborhood, and a dark clot filled the opening.

The trephine opening was then enlarged in a backward and downward direction, the artery spurting in the wound, following the direction of the clot. An unsuccessful attempt to tie the artery was followed by easily checking the hæmorrhage by packing a couple of small strips of iodoform gauze between it and the edge of the bone. The clot was then followed backward, and an opening in the bone three inches by one and three-fourths inches in its widest diameters was necessary to remove the clot, which extended at least three-fourths of an inch beyond the edges of this opening, was about three-fourths of an inch thick, and was removed with some difficulty by a sharp spoon. After its thorough evacuation, the much depressed dura was found apparently uninjured; a gauze drain was laid in the opening and brought out at the posterior angle. The two small pieces of gauze controlling the vessel

were brought out at the anterior extremity and the wound sutured. Immediately after operation, and before he was removed from the table, the patient moved the right arm and leg freely; both pupils reacted to light, and the character of the respirations was much improved. Temperature, $99\frac{2}{5}^{\circ}$ F.; pulse, 92; respiration, 20.

Consciousness was rapidly restored, and the following morning, July 2, his mind was clear and he talked freely. Temperature, 97° F.; pulse, 72; respiration, 15. No paralysis noted. His improvement after this was rapid. The temperature was slightly subnormal, varying from $96\frac{1}{5}^{\circ}$ to $98\frac{3}{5}^{\circ}$ F. for seven days, when it became and remained normal. On the fourth of July it was noted that the right side of the face was a little flaccid during whistling or smiling. The wound was dressed on the fourth day, found clean, and the packing removed. There was a little oozing from the anterior angle. The mental condition was normal from the morning after operation. The slight facial paralysis had disappeared by July 8. The patient was with difficulty persuaded to remain in bed for two weeks, and was discharged July 22 with a very small granulating area at the anterior angle of the wound; the rest healed solidly, although with moderate depression present.

CASE III.—*Contusion of Head; Concussion of Brain; Cortical Irritation, probably due to Minute Hæmorrhage or Laceration.*

H. W., white, aged nine years, was admitted to the Children's Hospital on the evening of April 19, 1902. He had been struck a short time before by a trolley-car; was unconscious when picked up, and remained so for five minutes. He was in a semistuporous condition when admitted, and very irritable on examination. He presented a contusion, with much swelling over the left supra-orbital region. The pupils were dilated, pulse small, and skin clammy. No paralysis. He vomited twice while still in the receiving ward. I saw him at this time and made a diagnosis of concussion. Soon after this, and when sent to the ward, he became totally unconscious, and about one-half hour later developed muscular twitching, confined to the right side of the face, lasting for a couple of minutes, and at the same time vomited freely. About ten minutes later he had a convulsion, preceded by twitching of the right side of the face, and then involving the right arm and leg and lasting for about fifteen minutes, the left arm and leg being affected during the latter part of the time also. The child

remained unconscious, and a third convulsion occurred while he was being prepared for operation, beginning on the right side and becoming general, although the movements were more marked on the right side throughout. There was external strabismus in the left eye; pupils equal and contracted. Breathing stertorous; pulse, 104; temperature, normal. Dr. Wharton saw him with me four hours after admission, and we decided, in view of the urgent and very alarming symptoms, to operate. Examination of the shaven scalp showed only the contusion in the left supra-orbital region. A flap was reflected at this point, and no fracture found. The right side of the face was now paralyzed, but the child seemed to be regaining consciousness. I trephined over the region of the middle meningeal artery on the left side, using the measurement already mentioned, but allowing for the age of the patient. The artery was at once exposed unruptured and with no clot to be observed. The opening was enlarged in a posterior direction over the motor area with the rongeur forceps, and the dura found apparently uninjured, with no evidences of fracture or subdural clot. During this time the right arm and leg continued to twitch. Bearing in mind those rare cases in which the symptoms of cortical irritation are on the same side as the lesion, a small semicircular incision was made on the right side, and a small trephine used to uncover the right middle meningeal artery. This was also found uninjured where exposed under the button, and the latter was at once replaced and the wound sutured. The first wound was sutured, a small gauze drain being inserted. As we had failed to find the cause of the alarming symptoms, the probable diagnosis was either a laceration of the brain, or minute hæmorrhage into the cortex. Following operation the symptoms rapidly ameliorated. The temperature rose to 102° F., falling by the next morning to 100½; pulse, 104; respiration, 24. There had been no more convulsions, and his mental condition had improved rapidly and was quite clear. The facial paralysis had disappeared, pupils were equal, strabismus gone. On the 21st his temperature fell to normal, and did not rise above 100 afterwards, and the improvement in his general condition continued. He slept a good deal for the first two or three days, but exhibited no other special symptom. The wounds healed by primary union. He remained in the ward for several weeks, during which time he exhibited no ill effects from his injury, when he was discharged apparently cured. His medication consisted of calomel and bromides for the first three

days and then bromide alone for several days longer, with small doses of digitalis for two days after operation.

In the first case reported the line of fracture crossed the anterior branch of the artery and explained its laceration. In the second case, where there was no fracture, the contusion was sufficient to rupture the vessel, a possibility well recognized. Tillaux showed that the adhesions between the dura mater and skull were weak in the temporal fossa, and this in fact constitutes the "zone decollable" of Marchant, and would favor rupture. The presence of perforating branches from the vessel which pierce the skull and are liable to be pulled upon when the elastic skull springs back after momentary depression by a force perhaps insufficient to fracture it (Steiner¹) also exposes the vessel and its branches to dangerous traction.

As regards the symptomatology of these cases, in the first case the classical clinical picture of extradural hæmorrhage was absent, the symptoms being more those of fracture of the skull with concussion or injury of the brain. The leakage of blood through the fissure into the subaponeurotic space probably relieved the pressure on the brain for a time and accounted for the preservation of consciousness and absence of paralysis. Gubler,² in a study of a large series of cases of fracture of the vault of the skull from Krönlein's clinic, reports a case in a boy four years of age in which there was apparently a rupture of the middle meningeal artery, a fracture of the skull, and a hæmatoma under the scalp communicating with the interior of the skull. The case recovered without operation. He quoted four analogous cases from Wiesman, two of them in children (observed by Holmes and Golding Bird), and explains the cause of this phenomenon in early life by the intimate adherence of the dura mater to the skull at this time. The temperature, slightly subnormal at first, then moderately elevated, was more suggestive of hæmorrhage, this being a common feature according to Phelps.³ The slow pulse is not always observed with epidural clot, but in this case the sudden drop to 48 before operation was significant of cerebral compression.

In the second case, that of the man, the clinical picture was most complete. The initial stunning, the interval of con-

sciousness followed by rapidly deepening coma, with subnormal temperature, slow pulse, stertorous breathing, and contralateral hemiplegia, and with dilatation of the pupil on the affected side, made up a symptom-complex which scarcely admitted of other interpretation.

In the third case the diagnosis of hæmorrhage, while less certain, was, I think, justifiable, and trephining strongly indicated. There was a history of loss of consciousness, followed by its partial restoration, and then in a short time a deepening coma with severe convulsions starting on the opposite side from the injury, and followed by paralysis of the face on that side. The exact nature of the lesion remains unknown, but it seems probable that there was a slight hæmorrhage or laceration in the motor area. In two of Phelps's cases of cerebral contusion there were general convulsions, and in both he found large pial hæmorrhages, with in one case intense congestion of the dura and in the other a limited contusion of the temporal area. Muscular twitching and general convulsions were observed by him after both hæmorrhage and contusion, but he regards such motor disturbances as more characteristic of contusion, as paralysis is of hæmorrhage. Cortical irritation causing convulsive movements was, however, pronounced, and contributed to correct diagnosis in a case reported by W. J. Taylor.⁴ The second trephining on the other side was indicated by the apparently desperate condition of the boy and by the possibility of that rare condition, as yet unexplained, of collateral palsy to which all authors allude, although some regard it as apocryphal. The rapid amelioration of symptoms after operation may have been due in part to relief of intracranial tension by trephining. The measurement which I used for locating the trephine openings and exposing the anterior branch of the artery in the second and third cases, two fingers'-breadth behind the external angular process of the frontal bone and three fingers'-breadth above the zygoma, is one which I have frequently tested on the cadaver, and corresponds in my own hand very closely to the measurement formerly recommended by Treves,⁵ viz., one and one-half inches behind the external angular process of the frontal bone and one and three-quarters inches above the

zygoma. It makes the point of exposure a little higher than Krönlein's,⁶ which is the one favored by Plummer⁷ after an exhaustive series of tests, and the one Treves⁸ now furnishes, and which is located on a line drawn through the supra-orbital ridge parallel to Reid's base line at a point from three to four centimetres behind the external angular process. Plummer found all the measurements recommended for exposing the posterior branch to be unreliable, but Steiner's as open to the least objections. This locates it at a point where a line drawn horizontally through the glabella is intersected by a vertical line running just in front of the mastoid process.

Steiner¹ and Plummer⁷ both suggested the applicability of an osteoplastic flap exposure of the vessel which would render unnecessary these exact measurements, avoid the necessity of more than one opening, and the necessary leaving of large gaps in the skull, such as are indispensable to a thorough removal of a large clot and perfect control of hæmorrhage. This method has been used several times for this purpose, as Plummer⁹ describes in his second article on this subject, where he reports two cases operated upon by the Hartley-Krause method in his own hands, with exposure of the clot, and recovery in one case, death in the second case being due to complicating injury of the brain. That the method is of value seems certain; but it seems to me that in cases of great doubt as to the existence of a hæmorrhage or fracture we should not always forego preliminary exploration by incision of the soft parts or even the application of a small trephine over the anterior branch of the artery.

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NEW INSTRUMENTS FOR THE TREATMENT OF ŒSOPHAGEAL STRICTURE.¹

BY THEODORE DUNHAM, M.D.,
OF NEW YORK.

I HAVE been led to devise new instruments for the treatment of cicatricial stricture of the œsophagus because those in common use are unsafe and often inefficient. The danger of exerting any considerable force in the passage of a bougie down the œsophagus needs no emphasis from me. The frequent disasters are well known. The chief danger arises from the fact that the bougie is not securely held to its course down the œsophagus. I think I have eliminated this danger by devising a guide and a bougie which must follow it.

The guide, or guide-bougie (A, Fig. 1), as I may call it, consists of an urethral bougie which terminates at one end in a piece of wire some three feet long. In order that the bougie may be securely attached to the wire, the wire is made to run through the axis of the bougie and is fastened to a metal tip at each end of the bougie. I have found a wire of German silver to be excellent for this purpose, because it allows one to give the bougie various bends to meet the exigencies of distorted strictures. The ordinary œsophageal bougie is hollow. To adapt it to my purpose, I have had both ends cut off, and for its tip have substituted a metal one through which the lumen of the bougie is continued (B, Fig. 1).

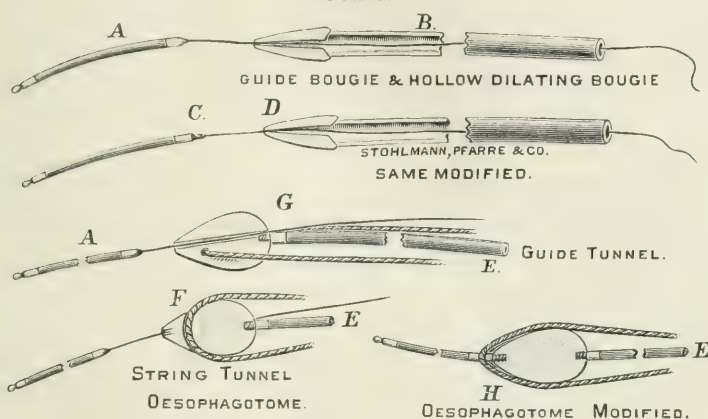
This form of bougie I use in the following way: A guide-bougie is chosen of such caliber that it will find its way to the stomach with so little resistance as to give perfect confidence that it has not punctured any weak portion of the œsophageal wall. The guide-bougie occupying the œsophagus, the hollow bougie is now threaded upon its wire and slid down the whole length of the wire. The bougie may now be pushed down the

¹ Read before the New York Surgical Society, March 12, 1902.

oesophagus, the guide holding it securely to its course. The guide, meanwhile, gets out of the way by curling up in the stomach.

It is essential that the wire be securely attached to the bougie portion, and it is to accomplish this that I have had the wire run through the axis of the bougie and rigidly attached to a metal tip at each end. In using the bougie some tension should be made upon the wire in order to keep the two parts of the instrument snugly together. I have also found it well

FIG. 1.



to have the patient's shoulders thrown forward and the head thrown back to straighten the path of the instrument, as this tends to prevent any kinking of the wire where the bougies join. There is some danger of this unless care is used. I have modified this form of bougie and guide with the idea of eliminating the danger of this kinking. Though I have not yet used the modification, I believe it is an improvement, and hence venture to report it.

In this modification the cap of the guide-bougie from which the wire projects ends in a portion of reduced caliber (C, Fig. 1), and this portion slides loosely into the lumen in the tip of the dilating bougie, this lumen being made somewhat larger than formerly to receive it (D, Fig. 1). The result of this arrangement is that the bougies in coming together lock in

such a way that there can be no kinking, and they form one firmly continuous instrument.

The curling of the guide in the stomach requires a little force, and when the bougie enters the stomach there may not be any marked lessening of resistance to indicate the fact. I have found it a safe plan to tie a string about the bougie to mark the point which will be opposite the incisor teeth when the end of the bougie is in the stomach. For a child of two years, this point should be about ten inches from the tip.

I have used these bougies after operation to maintain dilatation, and have felt that I was in little or no danger of having the bougie leave even a lacerated œsophagus. I have not thus far used them for dilating a stricture, but I feel that they would be safe and efficient for the dilatation of such strictures as yield before moderate force.

I have devised an œsophagotome for strictures which are pervious from above and resisting enough to make simple dilatation by bougies impossible or dangerous.

In the *Medical Record* of February 25, 1893, Dr. Abbe reported a case of œsophageal stricture which he dilated by means of a string and bougie. He passed a cord through the œsophagus, and then put the strictured portion upon the stretch by means of a conical bougie pushed up from the stomach. The string was then pulled to and fro, chafing through the stricture and allowing the bougie to advance until the strictured portion was of the caliber of the bougie. In Dr. Abbe's case the string and bougie entered the œsophagus from below by way of a gastrostomy opening, and the string found exit above by an œsophagostomy in the neck. Dr. Abbe had done the œsophagostomy in the hope of reaching the stricture through the neck wound. It was on finding this impracticable that he had the inspiration to chafe through the stricture by the string and bougie. He tells me that his patient remains well to-day with a competent œsophagus, and that a bougie is passed at intervals of six months.

My œsophagotome utilizes Dr. Abbe's ingenious and successful principle of chafing through the distended stricture by

a string which is pulled back and forth. But my œsophagotome is so constructed that the operation is carried out by working entirely through the mouth without opening the stomach. The instrument consists of a stout staff of whalebone, to the end of which is screwed fast an olive-shaped piece of metal. This olive is pierced by two tunnels. One is a curved tunnel having its convexity towards the end of the instrument and its two ends opening opposite one another well forward of the greatest diameter of the olive. This curved tunnel is accomplished by making two borings which meet at an angle. The sharp crest where the borings meet is smoothed down by pulling through a string covered with wet emery powder. Unless the metal is thus smoothed, the cutting string will itself be quickly chafed in two. This tunnel (F, Fig. 1) I have called the string-tunnel.

The second tunnel begins at the base of the olive, to one side of the screw which attaches it to the whalebone staff, and, passing diagonally through the olive, ends at its tip. This tunnel I will call the guide-tunnel (G, Fig. 1). The instrument is held to its course in the œsophagus by a guide-bougie like that used with my hollow bougies. To shield the soft parts of the pharynx from the scraping of the string while cutting, I have made a guard to hold the strings close to the whalebone staff. This guard consists of a handle to which are soldered two wires. These wires run along the whalebone staff and carry three wire loops encircling the whalebone, by means of which the guard may slide along the staff. The wires also carry two sets of lateral eyes in which the cutting strings may play to and fro. The strings are thus held away from the soft parts.

The method of using this instrument is as follows: An olive a little larger than the stricture is screwed to the whalebone staff. The two ends of the string which passes through its string-tunnel are threaded through the eyes of the guard. As a preliminary to using the string, it must be thoroughly soaked and cleared of any kinks or snarls. If the patient be a child, he is best seated in the lap of an assistant, with the shoul-

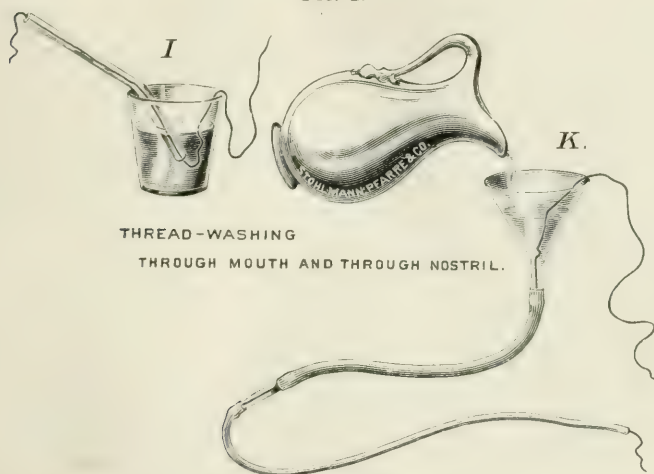
ders resting against a pillow in front of the assistant, and the head thrown back over the top of the pillow, the mouth held open by a gag. A guide-bougie is chosen of such size that it will readily pass the stricture. It is introduced until all but the wire has disappeared behind the epiglottis. The end must then be in the stomach. As no force is required in passing this guide-bougie, it cannot make a false passage. The wire of the guide-bougie is now threaded through the guide-tunnel of the olive, and the olive slid along the wire until its tip comes in contact with the bougie portion of the guide-bougie. By pulling upon the wire and pushing the staff, the guide and olive become now virtually one instrument. As the guide is necessarily in the œsophagus, the olive must follow it, and cannot make a false passage even if a fair amount of force is used. One thing must be guarded against,—kinking the wire where olive and bougie meet, by failing to direct the staff towards the œsophagus while the olive is still in the pharynx. Attention to the position of the patient and proper handling of the whalebone staff will prevent this from happening. When the olive is arrested by the stricture, the guard is slid along the staff until its end is beyond the epiglottis, and then an assistant pulls the string to and fro, pulling parallel to the staff to make as little friction as may be. Moderate pressure is made upon the staff, which causes the olive to put the stricture on the stretch, and the strings cut a passage for it. As the olive descends, the guide-bougie coils up in the stomach. Owing to the slight force required to coil the bougie in the stomach, the olive may not, when it has cut through the stricture, plunge suddenly into the stomach. It is not, therefore, safe to wait for a sense of lessened resistance as an indication that the olive has passed the œsophagus. The safe plan is to mark the whalebone staff at the point which should be at the incisor teeth when the olive is in the stomach.

I have very recently devised, but have not yet used, a modification of this œsophagotome (H, Fig. 1). In this modification the guide-bougie has no wire, but screws into the tip of the olive, and the string-tunnel of the olive is replaced by a hole

in the proximal metal tip of the bougie. In this form of the instrument it is not possible, first, to pass the guide-bougie alone, but it must be passed already attached to the olive. This means that the bougie cannot in difficult cases be passed with the same deftness; but in most cases it would be as easily and as safely passed, and the instrument is less complicated.

For those cases in which it is impossible by careful attempts with variously bent bougies of small caliber to traverse the œsophagus from the mouth my œsophagotome is not available, and a small opening should be made into the stomach. From

FIG. 2.



the stomach it may be possible to pass a small bougie up into the pharynx. If this succeeds readily, a thread may be drawn through, and the dilatation of the stricture may at once be proceeded with by an instrument which I will presently describe. If, however, a bougie introduced into the stomach does not readily find the cardiac orifice, rather than enlarge the opening into the stomach, I would let the patient recover from his anæsthetic, and after some days pass a thread through the œsophagus by a method which, though simple, is, I believe, entirely new. The apparatus consists of a glass of water, an ordinary drinking tube, and a piece of black silk thread

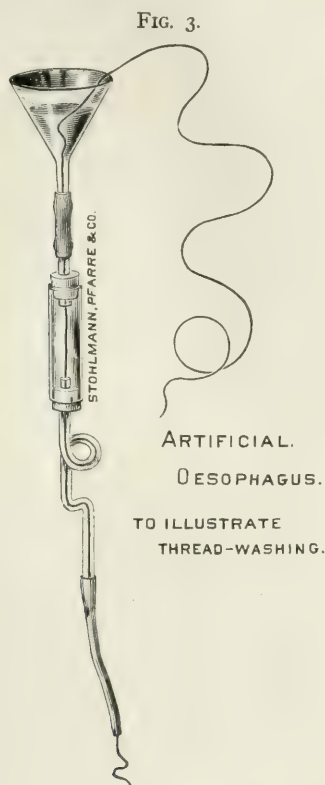
(I, Fig. 2). The tube is threaded so that the end of the thread is at the mouth-end of the tube. The patient then drinks water through the tube. I *wash down* the thread.

By experiment I have found that it is not a difficult matter to wash a thread through even a complicated system of tubes of various calibers and shapes. Some of the books recommend that, where a thread is to be passed into the stomach, its end should be weighted by a shot to facilitate swallowing. From my experiments and from clinical experience with my method, I feel sure that this weighting of the thread can only help to defeat one's object, and especially so where the œsophagus is strictured, tortuous, or sacculated. I find that the important matter is to have the thread untrammelled, and to allow it to float along with a current of water. The thread should be held slightly in check, so that it shall not pass onward with quite the velocity of the stream of water. If this is done, the tip of the thread is carried in the swiftest part of the current, and will find its way the more readily through places of smaller caliber, because there the current is swifter.

Before trying to wash a thread down the œsophagus of a patient, I first tested the feasibility of doing so upon an artificial œsophagus (Fig. 3). It is made of glass and rubber tubing. The funnel above may represent the pharynx. The channel passes from the neck of the funnel through a piece of rubber tubing and a piece of glass tubing, and then by means of a perforated cork into a glass tube of large caliber. This is intended to represent a dilated pouch above a stricture. The exit below from the large tube is by a small glass tube which passes half an inch into the large tube, to represent the mouth of the stricture as lying at a higher level than the bottom of the pouch. Thence the channel is continued by a piece of rubber tubing, by a piece of glass tubing which takes a circular turn in a vertical plane and then makes a sharp and constricted lateral bend, and the channel finally ends by a rubber tube having a diameter of about one-sixteenth of an inch. If a thread be introduced into the neck of the funnel, and the funnel be kept filled with water and gradually the thread be fed in, the thread

will be carried by the current of water through the whole system without difficulty. Should it be arrested at any point, a momentary pull will disengage it and allow it to pass on.

As stated above, the apparatus which I have used for washing a thread down the œsophagus of a patient consists of an ordinary drinking tube, a glass of water, and a piece of



black silk thread. The tube is threaded so that one end of the thread is at the mouth end of the tube. The patient then drinks through the tube. The thread is carried up the tube and on into the œsophagus by the current of water. More thread is fed into the water as it disappears up the tube, care always being taken that it is not fed in too rapidly. When several feet of thread have been thus washed down, the lower portion may be

fished out of the stomach by means of a bent probe passed in at the gastrostomy opening.

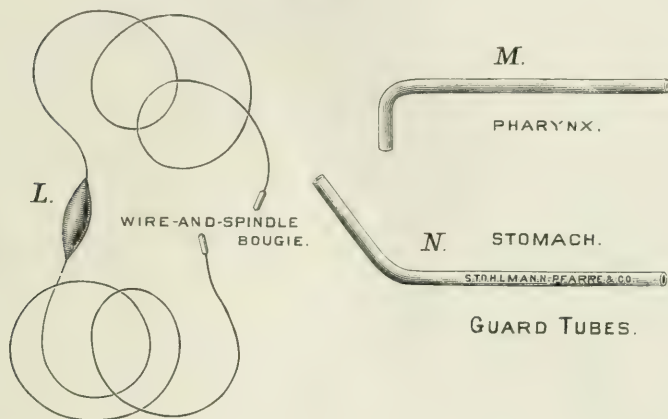
The above method, simple and excellent as it is, may at times fail, because it requires the co-operation of the patient. He must drink, and he must not snarl the thread in his mouth. Where this co-operation has been wanting, I have overcome the difficulty in the following way, also with perfect success.

To a glass funnel I attach a piece of rubber tubing, and to this, by a piece of glass tubing, a small rubber catheter the tip of which has been cut off (K, Fig. 2). A thread is washed down from the funnel until its end appears at the end of the catheter. The rubber tubing is now pinched to stop the flow of water and thread, and the catheter inserted into a nostril until its end hangs in the pharynx. A swallow of water is allowed to flow from the funnel, and then the tube is again pinched. Water is thus intermittently fed down the œsophagus, the thread going with the stream. After several feet of thread have disappeared down the funnel, the lower end of the thread is fished out through the gastrostomy opening as before.

Having got a thread through the œsophagus from the gastrostomy opening to the mouth, I next draw through a stouter double thread. There are thus two threads passing through the œsophagus. By one of these I pull through a stout linen fish-line. By the other I pull up one of my wire-and-spindle bougies. The wire-and-spindle bougie (L, Fig. 4) consists of a piece of wire five feet long, tipped at each end by a tiny knob, and carrying at its middle a spindle-shaped piece of metal. I have had made a series of these bougies carrying spindles of different diameters from No. 10 French up. By the thread I pull up the smallest size. If its spindle passes the stricture, I lash the other end of its wire to the wire of the next larger size, and by the first one pull up the second, and so on until a spindle is arrested by the stricture. When this happens the wire is kept taut, causing the spindle to put the stricture upon the stretch, and then the fish-line is pulled to and fro. A way is quickly cut for the spindle and it passes up to the

mouth. Wires carrying successively larger spindles are then drawn up and the stricture cut upon them until the caliber is deemed sufficient. To guard the soft parts of the stomach and pharynx from injury by the fish-line and the wire, I have made them play in two guard-tubes, which consist of aluminum tubing (M, Fig. 4), one being bent to pass into the pharynx

FIG. 4.



behind the larynx, and the other (N, Fig. 4) bent to pass through the gastrostomy opening and up to the cardiac orifice. These guard-tubes effectually protect the soft parts of the pharynx and of the stomach, and the fish-line plays easily through them. As soon as a way has been cut for a spindle, it is heard and felt to click against the upper guard-tube.

In contriving these instruments, I have had constantly in mind the fatal results which follow when an instrument leaves the œsophagus and punctures the vital structures which so snugly enwrap it. Each of my instruments follows a guide, and the guide is in each case introduced with so little force that one may feel sure that it cannot make a false passage. I have endeavored, also, to reduce to a minimum operative interference by the knife. I feel that the method of passing the œsophagus by washing down a thread obviates all necessity for making a large opening into the stomach. When once a thread has been passed, the wire-and-spindle bougies make it possible to dilate any stricture, and, I believe, with comparative safety.

KNIFE-BLADE REMOVED FROM LUNG.

BY JAMES FAIRCHILD BALDWIN, M.D.,

OF COLUMBUS, OHIO,

Surgeon to Grant Hospital.

IN the ANNALS OF SURGERY of July, 1902, is a report by Korteweg, of Leyden, of a case in which he removed from the lung a piece of lyddite-shell which had penetrated it about six months before his operation. The date of his operation was October 31, 1900. According to the statistics which he gives, his case would be the second in which a foreign body had been extracted from the lungs through an external incision.

It would seem reasonable to believe that the number of such cases is small, simply because surgeons have failed to report them. Nevertheless, it is not likely that the number of cases would be large were all reported, since death usually occurs pretty promptly after an injury of the kind under consideration.

On the 20th of June, 1898, H. S., of Dotson, West Virginia, was referred to me by Dr. Hatfield. The patient was a vigorous young man, aged about twenty-eight years, who, while acting as a deputy-sheriff, was stabbed by a prisoner whom he was trying to arrest. The prisoner used an ordinary cheap pocket-knife, and the blade broke off in the lung, the wound of entrance being in the right side just below the axilla. The injury had been inflicted April 1, three months before his coming under my observation. The wound had healed promptly, but there developed soon after symptoms of disease in the injured lung, and at the time when I saw him his general condition was quite similar to that of a patient well advanced in consumption. The point of consolidation could be easily mapped out, and in this region were many coarse râles. There was a good deal of purulent expectoration, and the ordinary manifestations of infection were pronounced.

Three radiographs were taken showing anterior, posterior,

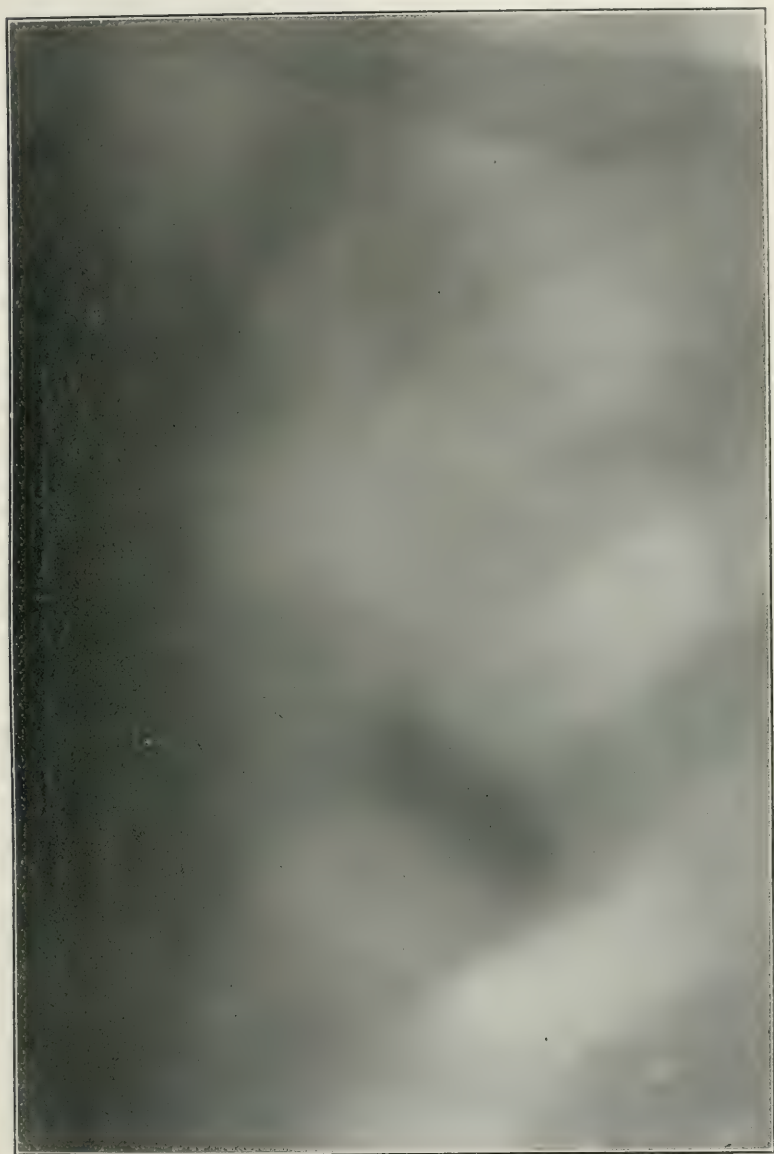


FIG. 1 shows blade in right lung.



FIG. 2.—Exact size of blade removed.

and lateral views. All of them showed the blade quite distinctly, but the anterior view was the most distinct.

The patient was operated upon at the Protestant Hospital, June 23, 1898, more than two years before the operation by Korteweg. The operation consisted in resecting about an inch of the overlying rib, the incision being made in the axillary line just below the scar left by the wound of entrance. It was expected that adhesions would be found at this point, so that the pleural cavity should not be opened, and in this we were not disappointed. A finger was pushed into the lung substance without difficulty, and thus hæmorrhage was obviated. The blade was encountered at a depth of about a finger's length, and forceps being introduced along the finger the blade was extracted. Drainage was introduced, and for several days there was considerable purulent discharge from the cavity in which the blade had been lying, this discharge being of a most offensive nature. It lasted, however, but a short time, and the patient was able to return home, with the wound healed and in greatly improved health, sixteen days after the operation. His recovery was prompt and complete.

ACUTE YELLOW ATROPHY OF THE LIVER AS A SEQUELA TO APPENDECTOMY.¹

BY MAX BALLIN, M.D.,
OF DETROIT, MICHIGAN.

ACUTE yellow atrophy of the liver is a rare disease; according to Osler about 250 cases are on record. This affection is also called Icterus gravis, Fatal icterus, Pernicious jaundice, Acute diffuse hepatitis, Hepatic insufficiency, etc. Acute yellow atrophy of the liver is characterized by a more or less sudden onset of icterus increasing to the severest form, headaches, insomnia, violent delirium, spasms, and coma. There are often cutaneous and mucous hæmorrhages. The temperature is usually high and irregular. The pulse, first normal, later rapid; urine contains bile pigments, albumen, casts, and products of incomplete metabolism of albumen, leucin, and tyrosin, the presence of which is considered pathognomonic. The affection ends mostly fatally, but there are recoveries on record. The findings of the post-mortem are: liver reduced in size; cut surface mottled yellow, sometimes with red spots (red atrophy), the parenchyma softened and friable; microscopically the liver shows biliary infiltration, cells in all stages of degeneration. Further, we find parenchymatous nephritis, large spleen, degeneration of muscles, hæmorrhages in mucous and serous membranes.

The etiology of this affection is not quite clear. We find the same changes in phosphorus poisoning; many believe it to be of toxic origin, but others consider it to be of an infectious nature; and we have even findings of specific germs (Klebs, Tomkins), of streptococci (Nepveu), staphylococci (Bourdillier), and also the *Bacillus coli* is found (Mintz) in the affected organs. The disease seems to occur always secondary to some other ailment, and is observed mostly during pregnancy (about one-third of all cases, hence the predominance in women), after

¹ Read before the Wayne County Medical Society, January 5, 1903.

typhoid fever, recurring typhoid, sepsis, syphilis, gonorrhœa (Aufrecht), sclerema neonatorum, and severe nervous shock (Albu); further on in phosphorus, antimony, and arsenic poisoning. As a sequel to operation, I have found only nine cases of acute yellow atrophy of the liver on record, therefore I consider the following case worthy of relating:

Mr. G. D., twenty years old, brass-worker, from healthy family.

Previous History.—Several times during the last two years, that is, since D. is working as brass polisher, slight lead colics. During the last year twice typical attack of appendicitis. No alcoholism. No venereal diseases.

Present sickness began on December 8, 1901, as another well characterized attack of appendicitis. I saw the young man first, in consultation with Dr. J. G. McAlpine, on December 9, 1901, at 3 P.M., thirty-six hours after onset of the appendicitis. I found temperature 101° F.; pulse, 98. Tongue very dry and coated. Respiration quiet. Face expression good. Abdomen flat. Muscular tension in right side. Ileocæcal region very painful. No dulness on percussion. Patient was somewhat restless and felt chilly. Operation recommended, but delayed, on account of absence of father, until 11.30 P.M. same day, at Detroit Sanitarium. Intramuscular incision. Appendix adherent to side of abdomen. Adhesions broken. Serosa of appendix covered with fibropurulent exudation. Meso-appendix thickened, also cæcum. Ligature of appendix. Stump touched with carbolic acid. Inversion and over-stitching impossible, as thread cuts through infiltrated tissue. But as all tissue seemed to be able to recover, the abdominal cavity was closed tight by suture in layers. Operation lasted twenty-five minutes. Chloroform narcosis was tolerated well. Only a small amount of chloroform was used. Pulse after operation, 96.

December 10, 1901. 9 A.M. Temperature, 98.6° F.; pulse, 100. Night: Restless and nauseated. Urine by catheter, eighteen ounces; later, spontaneous. Bowels moved after glycerin injection. Feels generally well. 6 P.M. Temperature, 98.4° F.; pulse, 94.

December 11, 1901. 8 A.M. Temperature, 98.4° F.; pulse, 82. Night: Fairly well. Slight jaundice of skin and conjunc-

tivæ. Several times slight vomiting. Somewhat restless in the afternoon. 8 P.M. Temperature, 97.6° F. (axilla); pulse, 88.

December 12, 1901. 7 A.M. Temperature, 98.8° F.; pulse, 88. Jaundice increased. Hunyádi water vomited. Evening restless and slightly delirious. Vomiting of greenish fluid at 5 P.M. 6 P.M. Temperature, 98° F.; pulse, 84.

December 13, 1901. 8 A.M. Temperature, 98° F.; pulse, 86. All night delirious and very noisy, slept only for short intervals, like in deep coma. Threw about his arms and legs violently. Jaundice increased. Afternoon vomited three times small quantities of black fluid. 5 P.M. Stomach washed out. He was so violent that he had to be held by three men while the stomach was washed. A small amount of brown fluid was found in the stomach, which contained disintegrated red blood-corpuscles. After washing, two ounces saturated solution of Epsom salts were left in the stomach. Stupor continued all day, changing to wild delirium. Bowels moved copiously at night. Bandage changed. Skin suture removed. Wound does not show any reaction, only a little bile-colored serum discharged from same. 7 P.M. Temperature, 100° F.; pulse, 116.

December 14, 1901. Temperature, 100.4° F.; pulse, 108. Delirium and coma seem to increase. Stool and urine involuntarily. No response to loud calling, pinching, pricking, etc. Yelled loudly and threw about his arms and legs. Stool contained bile like in severe chorea. In order to keep him in bed, two men had to hold his limbs all the time, and, as this caused too much strain, legs and arms had to be tied to the bed. Jaundice increased to a deep brown color. Patient swallows food after it is introduced forcibly between the teeth. There was no more vomiting since lavage of stomach. Bromide and codeine given in enema. 8 P.M. Venesection of right median vein, 300 cubic centimetres of blood removed. Intravenous saline infusion of 500 cubic centimetres. 8 P.M. Temperature, 102° F.; pulse, 124.

December 15. 7 A.M. Temperature, 102° F.; pulse, 138. Rested some after venesection. Perspired freely, so that all the bed-clothing was yellow with bile-stained perspiration. Also diuresis seemed to have been freer but involuntarily. Coma and delirium continue. Swallows food like yesterday. Urinated involuntarily. Examination of some urine gained by catheter shows albumen, casts, bile, and crystals of leucin and tyrosin.

Bromides, digitalin, bovinin, and saline solution are given in enema. 8 P.M. Temperature, 98.8° F.; pulse, 106.

December 16. 9 A.M. Temperature, 99.6° F.; pulse, 120. Rested more quietly during the night. Begins to respond a little, but is still mostly in a stupor. Icterus a little lighter. Liver-dulness small, one and one-half inches above rib-bow. Abdomen otherwise flat. Some punctiform hæmorrhages on arms and legs. Wound without any inflammatory symptoms.

From now on all the symptoms decreased in intensity, pulse went down, temperature remained about normal, icterus disappeared gradually, and consciousness returned slowly. Patient got up on the 5th of January, and left the hospital on February 11. At that time there was still some jaundice and small liver-dulness.

Reviewing this record, we have the case of a young brass-worker operated upon for an acute appendicitis. The appendix, cæcum, and omentum were quite inflamed and swollen. The first three days after the operation everything looked favorable except a slight icterus. Then in the fourth night serious delirium developed, very violent spasms set in, only to be interrupted by a deep comatose condition. At the same time deep icterus existed, hæmorrhagic masses were vomited, bile, albumen, casts, leucin, and tyrosin appeared in the urine, the liver-dulness was much diminished. This serious condition lasted five days, to yield finally to a slow improvement.

There can be no doubt but that we had to deal with a case of acute yellow atrophy of the liver after an appendectomy under chloroform. We saw all the typical symptoms: icterus, delirium, spasms, coma, fever, leucin, and tyrosin in the urine. Even the small liver-dulness could be percussed. I think that every one would agree with my diagnosis if I could add to the record of the case an autopsy report! Indeed, recoveries after acute yellow atrophy of the liver are so exceptional, that, for instance, Sajous, *Annual Cyclopædia* (1899, Vol. v, page 395), says, "The disease is so fatal that recovery almost implies a mistake in diagnosis." But, as I mentioned before, there certainly are some recoveries of undoubted cases of this sickness

reported. Weising could gather sixteen cases of favorable termination. I was able to find some more recoveries recorded (Albu, Dobie, Laigne-Lavastine). Senator believes in possibility of recovery, so does Bouchard and others. Nevertheless, the mortality seems to be about 95 per cent.

As already mentioned, very few similar cases after operation are on record. I could find only nine, none of them in this country. The following table will give particulars of these ten cases.

All these ten cases have in common that one or two days after an operation a slight icterus developed, followed by vomiting of sometimes bloody character, serious delirium, coma, and in nine out of ten cases death. Four of the patients were male, three female—in three the sex is not mentioned. Their age varied between twenty and forty-two years. In seven cases chloroform was used as an anæsthetic, once Billroth's chloroform mixture; in two cases the anæsthetic is not named. As predisposing causes alcoholism is given in three cases (Cases 1, 7, and 9); indigestion twice (6 and 8); once with slight catarrhal icterus (6); lead once (10). In one case the affection followed herniotomy with resection of adherent omentum (4); in three cases uterine or adnexa operations; one of them removal of an ovarian cyst with torsion and necrosis of the pedicle (5); one a hysterectomy with morcellement of uterine fibroids (6), and one removal of the adnexa for chronic salpingitis; twice an appendectomy (6 and 10), both cases with inflammation and suppuration, and one time the only operation not abdominal, a very difficult teeth extraction from suppurating jaws (8). The clinical history of Bastianelli's cases was not obtainable; I could not get a copy of his essay and had to content myself with a short excerpt. Autopsies were made in all nine fatal cases and showed every time the serious degenerative condition of the liver, besides nephritis and degeneration of the heart muscle. Multiple punctiform hæmorrhages of mucous membranes were found three times. Mintz found in his case the bacterium coli in the liver parenchyma.

After this analogous experience of six different authors in

TABLE OF CASES OF POSTOPERATIVE ACUTE YELLOW ATROPHY OF THE LIVER.

367

ACUTE YELLOW ATROPHY OF THE LIVER.

No.	Author.	Age.	Sex.	Predispo- sition.	Anæsthetic used.	Operation performed.	Onset of Icterus.	Symptoms.	Result.	Autopsy.
1		?	?	?		?	?		+ be- tween sec- ond and tenth	Fatty degeneration of heart. Slight ne- phritis. Punctiform hemorrhages.
2	Bastianelli.	?	?	?	Chloro- form.	?	?	Icterus, vomiting, delirium.		
3		?	?	?		?	?			
4	Bandlet.	42	Male.	Alcohol.	Eighty grammes of chloro- form.	Hemiotomy, with resection of ad- herent omen- tum.	One to two days.	Icterus, delirium, co- ma; temperature, 40° C.	+ on fourth day.	Acute yellow atrophy of liver. Icterus univer- salis. Multiple hæm- orrhages. Nephritis.
5	Stocker.	?	Female.	?	?	Ovarian cyst, with torsion and ne- crosis of pedicle.	?	?	+	Acute yellow atrophy of liver.
6	Erlach, re- ported by Bandlet.	?	Female.	Catarh, icterus.	Billroth mixture.	Exstirpation of ute- rus, with mor- cellement of fibroma.	?	Icterus, delirium.	+	"Atrophia hepatis acuta rubra et flava."
7	Mintz.	40	Male.	Alcohol.	?	Appendicitis, with abscess.	One day.	Icterus, hæmateme- sis, convulsions, fever.	+ on sixth day.	Fatty degeneration of heart. Parenchyma. Nephritis. Acute yel- low atrophy of liver. Bacterium coli in liver. Erosions in duo-de- num and stomach.
8	Marten.	34	Female.	Insanity, indiges- tion.	Seventy c.c. of chloro- form in 40 minutes.	Extraction of four- teen teeth from suppurating and necrotic jaw.	One day.	Icterus, vomiting, al- bumen, casts, in urine, delirium, yelling, coma.	+ on fourth day.	Fatty degeneration of heart, kidneys. Acute fatty degeneration of liver.
9	Cohn, of Sonnen- burg's Clinic.	21	Female.	Alcohol.	Chloroform.	Salpingo-ovarec- tomy for pus- tules.	Two days.	Icterus, fits of yelling, delirium, albumi- nuria.	+ on fifth day.	Cloudy swelling of heart, liver, kidneys. Icteric nutmeg liver.
10	Ballin, (Author's case.)	20	Male.	Lead.	Chloroform.	Appendicitis in in- flamed at a torry stage; adhe- sions.	Two days.	Icterus, delirium, co- ma, fever, bloody vomiting, albumen casts, tyrosine in urine.	Recov- ery.	

ten cases, it is evident that acute yellow atrophy of the liver may occur as one of the rarer complications after operations. Our text-books, some of them with otherwise very exhausting chapters on the complications of the post-operative period, and many special essays on the same topic, do not mention this rare complication at all, at least as far as I have been able to look this up.

As to the etiology of this serious degenerative process in the liver after operations, the few observers disagree in the same line of thought as the authors on the etiology of acute yellow atrophy in general. Some believe it to be of toxic origin; others, of infectious nature. Bandler, Bastianelli, Marten, and Cohn consider the chloroform used in narcosis to be the cause. Mintz found bacterium coli in the affected liver and thrombotic processes in the duodenal arteries, and believes, therefore, in infectious origin. The advocates of the theory that chloroform causes the degenerative process in the liver bring forward many arguments in favor of their opinion. First, a mild icterus after narcosis with chloroform is observed quite often, as first pointed out by Nothnagel in 1866. By experiments on animals, Nothnagel, Toth, Unger and Junker, Stromel, Strassmann, and Ostertag showed beyond doubt that chloroform causes degenerative changes of the liver cells analogous to changes in kidneys and heart muscle. Bandler repeated the same experiments, and compared them with findings after ether inhalations. Chloroform always gave said degenerative changes, ether never.

In men Nothnagel studied first the action of chloroform on the liver, as already mentioned, further on Thiem, Fischer, Fraenkel, and others could always find in cases of chloroform death, degeneration of the liver concurring with destructive changes in kidneys, heart, and muscles. Luther showed on a series of cases that bile in the urine and icterus after chloroform comes and goes with albuminuria. Hence, we have first the clinical observation that chloroform causes sometimes icterus, then we have the proof of autopsies in cases of chloroform death that this anæsthetic can produce degeneration of liver

cells, and finally we have the proof by experiments on animals. Therefore, the conclusion that the acute yellow atrophy in the cases under consideration is simply caused by the chloroform seems to be justified. The experience of our ten tabulated cases shows that chloroform was used seven times; in three cases no mention is made of the anæsthetic used; there is, anyway, as far as I could find out, no such case on record after an ether anæsthesia. But looking over the history of the seven cases,—excepting the three cases of Bastianelli, without an exact clinical history,—we find that in every case an inflammatory condition existed at the time of operation (abscess, appendicitis, torsion of pedicle, etc.). There is no record of any case after an operation in healthy tissue. Six of the operations were laparotomies; only one was outside the abdomen,—the tooth extraction with necrosis of the jaw. This leads to the supposition that infection, furthermore, the handling of inflamed intestines and omentum, is also an important factor. We saw this destructive liver process happen after the same kind of operations after which we meet with thrombosis of the femoral vein, lung infarcts, and other complications of thrombotic and infectious origin. Finally, we must not overlook the fact that some disposition lessening the resistance of the liver cells, as alcoholism, lead or catarrhal jaundice, was recorded in nearly every one of our cases. Considering this, it seems probable that acute yellow atrophy of the liver, after operation, is caused by infectious processes with the help of the toxic influence of chloroform upon the liver. A predisposition by alcohol, etc., as mentioned, seems to be essential as causative factor; however, more observations are needed to clear this etiology. For instance, if some one could report a similar case after ether inhalation, we would have to abandon the idea of chloroform being a causative factor.

In nearly every one of the cases considered we find hæmorrhagic vomiting as a symptom with the malign jaundice. There seems to be some relation between the degenerative process of the liver as described and hæmorrhagic vomiting after operation, as Billroth, von Eiselsberg, Landow, and others

have reported. All the later cases happened after serious laparotomies with omental resections, etc., and their autopsies showed multiple fresh ulcerations of stomach and duodenum, which were also found in Mintz's case of acute yellow atrophy of the liver. Eiselsberg believes the ulceration to be caused by septic thrombotic processes, while Landow considers the chloroform to be their cause. Hæmorrhagic vomiting is observed as a symptom in most cases of acute yellow atrophy of the liver; Landow, on the other hand, observed in one of his cases of hæmatemesis after appendectomy, simultaneously severe icterus, although without delirium. This is the reason that I suspect some relation between the two rare complications of the postoperative period, viz., between the hæmatemesis and the malignant jaundice. Maybe both are caused by the same factor, chloroform or infection; maybe the primary changes in both cases are located in the red blood-corpuscles which are essential in carrying the chloroform through the body (Pohl), and also in thrombotic infections. Further observations and experiments will throw light on these questions.

As to the treatment of postoperative yellow atrophy of the liver, our cases give us first a lesson in prophylaxis. The long use of chloroform should be avoided where alcoholism or some other chronic ailment has caused a catarrh of the liver ducts, especially when we have to deal with inflammatory conditions of the viscera. The narcosis, if deemed advisable, can be started with chloroform, but after a short time ether should be substituted; we have to consider that this serious liver affection is at least partially a consequence of chloroform. In a recent publication on "The Accidents of Anæsthesia," Eisendrath supports the same idea by saying, "Chloroform should never be given when it is necessary to administer it for more than an hour, on account of its degenerative effect upon the heart muscle and parenchyma of the liver and kidneys."

If we have to deal with a case of malignant jaundice, the odds are surely against us. Recovery will be the exception. The success in my case I attributed mostly to the venesection and the following intravenous saline infusion. The malignant jaundice is the consequence of a destructive liver disease, just

the same as uræmia is a sequela to degenerative processes in the kidneys. The French term for the affection "hepatic insufficiency" characterizes this condition. Considering some good results had with venesection and saline infusion in the treatment of eclampsia, I decided to try the same treatment in my case, which seemed then almost beyond hope. The result was a free diuresis and abundant bile-stained perspiration, just as I had noticed the beneficial influence of the same treatment in uræmia. Bouchard mentioned that all the cases of acute yellow atrophy of the liver which recovered showed this "polyuric crisis," that is, a sudden, large diuresis. Besides the venous infusion after venesection, cathartics, diuretics, and rectal enemata will contribute to the same end, to a speedy and thorough elimination of the toxin produced by the insufficiency of the liver.

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PRIMARY RETROPERITONEAL SOLID TUMORS.

WITH REPORT OF A CASE.

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Miss D. C., a native Tennessean, aged thirty-one years, of healthy parentage, had typhoid fever six years ago, and with this exception enjoyed good health until the summer of 1901. From that date she has suffered with frequent attacks of abdominal pain accompanied by vomiting and obstinate constipation. Her average weight prior to 1901 was 120 pounds; during the autumn of that year she gained flesh rapidly, and on January 1, 1902, weighed 150 pounds. At this date she first noticed a swelling in the epigastric region, which grew perceptibly, distending the entire abdomen. Palpitation, difficult breathing, obstinate constipation were constant features, varied by seizures of severe pain and vomiting, recurring at intervals of about ten days. Otherwise, her general health remained good; there was no menstrual disorder or urinary disturbance.

During last August her suffering was more prolonged and intense than usual, and she was brought to me on the night of August 12. The physical examination disclosed a peculiarly distended abdomen; its shape was somewhat cylindrical, with circumference as great at the epigastric as at the umbilical and sub-umbilical zones; the flanks were not bulging. The enlargement was greater than that of a full term pregnancy. The tumor was tense, elastic, but not fluctuant, slightly lobulated, and produced symmetrical enlargement. The tumor was everywhere dull upon percussion, no area of resonance separating it from liver-dulness. There was fixed dulness in the right flank. In the left iliac and lumbar regions tympany was elicited, also over a small area close to Poupart's ligament on the right side. Combined vaginal and abdominal examination revealed a virgin uterus crowded to the floor of the pelvis by a soft yielding mass, which entirely filled that cavity. The appendages could not be defined. Urinary analysis was negative; the quantity of urine voided in the eighteen

hours in which the patient was under observation was insufficient. There was no cachexia, œdema of extremities, venous varicosity, or glandular enlargement. The patient appeared well nourished and in good health save for the cramping pains in the abdomen from which she was then suffering. These were ascribed to partial intestinal obstruction from pressure.

With abdomen open, the tumor presented every appearance of an ovarian cyst. The signs pointed so clearly to presence of fluid that a trochar was used, but no fluid was obtained. It was impossible to pass the hand down into the pelvis to ascertain the relations of the tumor, hence the wound was enlarged upward. The tumor was now found to lie retroperitoneally, encircled by the colon. Its enucleation seemed feasible. The parietal peritoneum over its most prominent surface was divided, and the mass quickly and easily enucleated from its bed in the cellular tissue of the loin to the right of the spinal column. It grew between the folds of the ascending mesocolon, and in its removal there was but little disturbance of the vascular supply of the gut. Hæmorrhage was very slight, controlled by hot pads. The bed of the tumor was lightly packed with gauze, and the incision in the posterior parietal peritoneum sutured, save a small opening for the gauze drain.

At this writing, four months from the date of operation, the patient is well.

The tumor, when removed, weighed fourteen and one-half pounds. It was submitted to examination by Dr. Larkin Smith, Director of the Laboratory of Pathology, University of Nashville, who reported that it was a lipomyxoma with a round-cell sarcomatous base, the large mass of the body of the tumor being composed of almost pure myxomatous tissue with a few elements of adipose tissue scattered through it.

Definition.—The term primary retroperitoneal tumor implies a solid neoplasm growing behind the peritoneum or between its folds, and not genetically connected with any of the retroperitoneal organs.

Frequency.—There seems to be an impression among surgeons that these tumors are so rare that they are scarcely worth consideration, and this is borne out somewhat by Mr. Lockwood's statement that no specimen of retroperitoneal sarcoma,

which is the most frequent form of tumor, had been presented to the Pathological or Medical Society of London prior to 1895. In a recent discussion in the Medical and Chirurgical Society of London, following a report of a case by Mr. Sheild, it appears that the members were quite unfamiliar with the subject. The author read a paper before a body of America's leading surgeons, and none present had had any operative experience with these tumors, yet numerous cases are recorded, especially within the last few years.

Varieties.—The types of retroperitoneal tumors belong to the connective-tissue group. The innocent tumors are *lipoma*, *myxoma*, and *fibroma*; the malignant is *sarcoma*. In analysis of twenty cases of solid retroperitoneal tumors collected by Rogowski, sarcomatous tissue was found in every one.

Etiology.—There is nothing definitely known as to the cause of these tumors; but from instances quoted above and others found in the literature it seems that sarcomatous degeneration is engrafted upon pre-existing innocent growths, whose presence has been recognized for many years. There is one instance in which pre-existing retroperitoneal, possibly sub-diaphragmatic, abscess may have had some causal relation.

Age. They usually occur after maturity, between the ages of thirty and fifty years. Primary sarcoma is very rare in children, yet Arnstein collected ten cases, including one of his own, a female four years old.

Sex. It occurs with equal frequency in both sexes.

Pathology.—Origin. The structures involved primarily show that these growths originate in the retroperitoneal cellular tissue, retroperitoneal and mesenteric glands, from the sheaths of the great blood-vessels, and from the vertebræ. In one inoperable case of fibrosarcoma upon which I made an autopsy, the tumor appeared to arise from the root of the mesentery, its other attachments being very slight.

In a case recently operated upon, the origin of the tumor was in the sacrum; the growth lay entirely in the pelvis.

Sarcoma. As above stated, sarcoma is the predominating tumor. The microscopical picture is generally of the spindle-

celled sarcoma, yet in literature we meet with such descriptive terms as myxosarcoma, liposarcoma, lymphosarcoma, and cystic sarcoma. The last variety is so closely allied to cysts that Moynihan classifies it as one of the varieties of mesenteric cysts.

An important pathological characteristic of retroperitoneal sarcomata is that they are encapsulated, yet metastases occur in about one-half the cases; liver, lungs, and mesenteric glands are the parts involved. These tumors sometimes attain to an enormous size. In Waldeyer's case, quoted by Rogowski, the sarcoma was joined by a large fatty tumor. Other cases are reported of sarcoma associated with other growths.

Lipoma. A most characteristic specimen of lipoma was obtained at autopsy by the late Professor Mudd, of St. Louis; the tumor weighed sixty-six pounds, and had a distinct fibrous capsule.

Fibroma. I removed post-mortem a tumor that had existed fifteen years, entirely unconnected with any of the viscera, which was distinctly encapsulated and attached by a strong, broad pedicle at the root of the mesentery. It was declared by the pathologist to be a myofibroma.

Symptoms.—Retroperitoneal tumors possess certain well-marked characteristics not found in primary intraperitoneal neoplasms. The latter originate primarily between the duplications of the peritoneum and are attached to the organ from which they spring; while retroperitoneal tumors originate in the retroperitoneal space, unattached to viscera, and as they develop they encroach upon the peritoneal cavity, pushing the organs contained therein either forward or to the side in a most typical manner (Witzel).

A patient bearing an innocent retroperitoneal tumor of moderate size may evince no constitutional disturbance; but usually the large size of the tumor causes disturbance of the digestion and respiration. The kidneys are frequently displaced and compressed by the growth. The blood-vessels and lymphatics are obstructed. The intestines may be occluded by pressure. Consequently, general emaciation is one of the most constant and oftentimes the only symptom, barring the presence

of the tumor, of innocent neoplasms. But unfortunately, as we have shown, these tumors are often primarily malignant, as is evidenced by the rapidity of their growth and the early and pronounced cachexia.

Pain, when present, is usually due to constipation, with threatened obstruction, and may be associated with nausea and vomiting.

Tenderness is absent unless there is peritoneal involvement.

In many instances, from pressure, metastatic glandular involvement, and peritoneal irritation, we find ascitic fluid, often of such quantity as to obscure the physical signs. A valuable symptom, and one which not infrequently occurs early, is œdema of the extremities. As before stated, the renal secretion is often disordered, but in only one instance has blood been found in the urine.

Physical Signs.—Inspection. The appearance of the abdomen in these growths is by no means characteristic. They grow anteriorly, as Vander Veer says, in the direction of least resistance. The greatest swelling is usually in the upper portion, at or above the umbilicus. When of large size they may produce a very pendulous belly (Mudd's case). The abdominal distention is usually asymmetrical. The size and location of the tumor, therefore, influence the morphology. The superficial veins are very much enlarged, and respiratory movements of the tumor may be observed. In Ransohoff's case the tumor lay chiefly in the right side, and moved distinctly with respiration. Especially in mesenteric tumors is the function of the intestines impaired; this obstructive feature, being chronic in character, develops intestinal hypertrophy, and I have observed distinct peristaltic patterns in one case.

Palpation. Tumors mesenteric in situation are exceedingly movable, while those close to the parietes are fixed. They are usually smooth, with their borders distinctly defined. They are firm in some instances, elastic, but not fluctuant unless undergoing cystic degeneration. In Mudd's, Ransohoff's, and Guillemain's cases of large retroperitoneal lipomata, fluctuation was apparently distinct. Lipomata impart a sensation more

like that of the liver, and they are often lobulated. Palpation and conjoined manipulation will negative their association with the pelvic and other organs.

Percussion. This note varies with the size and position of the tumor. That this sign may be employed to the full of its diagnostic value, the bowels should be freely evacuated, and the patient should be examined after colonic inflation with gas, and in different positions. Auscultatory percussion is of infinite value in determining intestinal relations. Assuming the case to be one in which the tumor is of moderate size, say as large as a child's head, if central in position, it is surrounded by a zone of resonance; if lateral in position, the resonance is at the umbilical border. But one essential and characteristic feature of these retroperitoneal tumors is that there is fixed linear resonance, elicited by light percussion, either upon one side or across the surface of the tumor. As Witzel says, in these retroperitoneal tumors the colon bears a typical and most diagnostically important relation. We must remember that these tumors originate near the spine; therefore, when small, the colon may be to the outer side. As they grow the colon lies in front; and when they attain to great dimensions the colon lies across or to the umbilical border. In small mesenteric growths the overlying intestines may give central resonance; it is in this form of tumor that a change of position will give us varying resonance. The accompanying ascites, which is not an infrequent complication, will often obscure the presence of the tumor, or mislead us by varying dulness.

One of the most important of the diagnostic signs, revealed both by percussion and palpation, is that the tumor is separable from the solid viscera; yet in tumors of large size with right lateral evolution the colon, ascending and hepatic, is displaced downward and to the centre, and there is no differential resonance between the liver and the tumor. If the patient is examined in Trendelenburg posture, an area of resonance in the lower zone of the abdomen, skirting the pubis and Poupart's ligament, can usually be outlined. This is of immense value in eliminating uterine and ovarian growths.

Complications.—The most usual complications occurring in the course of solid mesenteric tumors are ascites and intestinal obstruction.

Differential Diagnosis.—Innocent growths are recognized by their long duration and the comparative absence of symptoms; and fatty tumors, especially, by their lobulated character, elastic, almost fluctuant feel.

The malignant tumors are rapid in growth, produce complications of ascites and œdema, and are quickly productive of cachexia.

Tumors of the solid viscera, spleen, kidneys, and liver may be mistaken for these growths; yet the functional and constitutional disturbances, and carefully applied physical tests, should make the differentiation.

Prognosis.—The prognosis in lipoma and other forms of innocent tumors is ultimately as grave as in sarcoma, the disturbances from pressure finally bringing about death from marasmus. And, as we have shown, the possibility of change to malignancy must be taken into consideration.

As illustrative of operative results, we would refer especially to the successful case of Harris and Herzog, who removed a large lymphosarcoma, and with it fifty-one centimetres of attached intestine. The patient recovered. Also the case of Shepherd, of a fibromyxoma weighing thirteen pounds, with resection of seven feet and eight inches of intestine, with recovery and restoration of his patient to health.

Contraindications to Operation.—Pronounced cachexia, metastasis, and manifest universal attachments are contraindications that interdict even exploratory incision. After opening the abdomen, which procedure in every case is more or less exploratory, the relations and attachments of the tumor may contraindicate further effort.

Surgical Indications.—The known encapsulated character of retroperitoneal sarcomata, and oftentimes their long duration without metastasis or cachexia, encourage the surgeon to undertake operation. The dangers presented are hæmorrhage and necrosis of the intestines or parietal peritoneum.

The surgical procedure is enucleation of the tumor, but in doing this we must bear in mind that the intestinal circulation may be cut off. When its integrity is impaired, resection of the gut, as in the cases above quoted, is necessary. Drainage must be provided, and is usually best obtained through the loins.

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CLOSURE BY SUTURE OF INTESTINAL PERFORATIONS COMPLICATING TYPHOID FEVER.¹

REPORT OF THREE CASES.

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IN the case of the one patient in this series who survived the surgical intervention, the interesting feature was presented of a faint omental agglutination well occluding a very recent perforation. This observation suggests the surmise that had the therapeutic measures directed towards intestinal immobilization, as advocated by Ochsner, been rigorously observed, Nature's result, instead of a surgical closure of the lesion, might have been equally gratifying.

It is not intended by this citation to advocate the slightest procrastination in dealing surgically with this most serious complication of typhoid fever,—quite the reverse,—but to note the importance in cases where operation has to be delayed or is absolutely refused, of utilizing every possible resource which may aid Nature's effort to seal the intestinal defect by maintaining undisturbed the opposing serous surface, preferably of the omentum.

Speculative interest attaches also to the larger and firmer omental adhesion met with in the same patient. Did it represent a preperforative precaution, or the successful closure of a perforation antedating the other and yet occurring without recognizable symptoms? Or was it a more securely attached agglutination about a perforative lesion of the same date as the one treated by suture?

Finally, what is the ultimate behavior of these omental adhesions? If they persist, may they gradually stretch and

¹ Read before the New York Surgical Society, November 12, 1902.

offer a sufficient source of future danger as bands to justify severance and the substitution of sutures?

CASE I.—A woman, twenty-one years of age, was admitted to the medical service of the Presbyterian Hospital, July 12, 1902, suffering from typhoid fever. Her illness had begun gradually two weeks before with chilly sensations, headache, malaise, anorexia. She had three epistaxes in first days, vomited once or twice. Throat a little sore. Diarrhœa began early and continued until admission. Four to six loose movements a day without pain. Character of stools not noted.

Five days before admission she went to bed on account of increased prostration, weakness, fever, and headache.

Fever has been continuous since then, frequent chilly sensations, no hard chills. No sweating, no alternation of days. Slight dry cough, no pain in chest.

Headache severe, insomnia troublesome, but patient feels dull and heavy, hearing considerably impaired.

Anorexia absolute. No vomiting since over a week ago. Bowels loose; only moved once on morning of admission.

Micturition infrequent. Urine dark.

For three weeks the patient was sustained through the progress of a typhoid fever of moderate intensity, when, during the night of August 2, eighteen days after admission, she complained of cramp-like pain over the cæcal region. One-half hour later, at seven o'clock, an ice-bag was applied, and pain disappeared for an hour, when it returned and was much sharper. At eight o'clock, leucocytes, 4600.

10 P.M. Abdomen was markedly retracted, tenderness over cæcal region only, no tympany in any part on percussion. Pulse of good quality.

12 M. Pain severe. Bowels moved without relieving it. Morphine, one-tenth grain, hypodermically, relieved pain somewhat.

August 3, 2 A.M. Patient asleep, but groaned in sleep. 4 A.M. Temperature fell to 97° F. Pulse still good in quality. Pain less. Abdomen somewhat less retracted, beginning to be a little rigid in right lower quadrant, extending up right side. Patient vomited albumen water.

8 A.M. Pain is more general. Abdomen slightly distended,

tender over a large area, rigidity more marked and spreading towards left side. Liver percussed to seventh space.

10 A.M. Patient vomited again albumen water and bile-stained fluid. Abdomen rigid over all, slightly distended, very tender, more so on right side. Pulse 128, of poorer quality. Leucocytes, 6500.

I was then requested by Dr. Thacher to see the patient, and advised immediate operation for the existing peritonitis, due probably to perforation.

The abdomen was opened at 3.30 P.M., of August 3, twenty-one hours after the onset of the symptoms of perforation, under chloroform narcosis, by a median incision below the umbilicus four inches long. A large amount of yellow fluid largely composed of milk with foul odor gushed out. A three-inch intermuscular incision was then made on right side. Appendix found congested, but apparently due to external causes. A small circular perforation in ileum found and closed with Lembert sutures of silk. Small gut then examined further and two other perforations found and closed in same way. The first was minute, but the second was about one-half an inch in diameter and surrounded by yellow membrane, evidently the main channel of the intestinal content escape and cause of the general peritonitis. The peritoneal cavity was thoroughly irrigated through the two wounds. A tube was inserted through the posterior vaginal fornix into peritoneal cavity and wrapped with gauze. Parietal wounds were then closed in layers without drainage. Time, thirty-five minutes. Condition poor, becoming critical.

Patient was freely stimulated during night. Perspired freely all the time. Abdomen became gradually more distended and tympanitic, and she died twenty-eight hours after operation. So much thick yellow discharge mixed with light yellow fecal matter flowed from the vaginal drainage tube as to have suggested that another perforation had occurred. Temperature at death, 107.5° F. Leucocytes, 11,000.

CASE II.—A man, forty years of age, was admitted to the Presbyterian Hospital, July 17, 1902. Two weeks previously, after drinking freely of beer, he felt badly, with vomiting and gastric distress. The following day he went to work, still feeling weak and apathetic. The next day he got very drunk on whiskey and had marked symptoms the next day. There was some head-

ache. An occasional epistaxis occurred during the succeeding ten days. Bowels somewhat constipated. He took "magnesia" every day with some slight movement as a result. Pain in the back was troublesome and headache severe. He kept at work right along, however. On the day of admission, while at work in a strained position with arms above his head, he had a sudden sharp pain in lower right quadrant of abdomen of a most severe character; it "doubled him up," but he reached home. Pain was so severe that he rolled about the floor; this gradually diminished, but tenderness increased until the parts could not stand the slightest pressure. When admitted seven hours after onset there was almost no pain, no vomiting, but tenderness extreme. Bowels had not moved since previous day. Temperature had risen to 105.8° F. He was well nourished, corpulent. Facies anxious and restless. Lips and tongue very tremulous, the latter heavily coated with a yellow fur and dry.

Abdomen was considerably distended and rigid over all, particularly in right iliac fossa for four inches below the level of the umbilicus. Here there was exquisite tenderness, elicited on slightest touch. Percussion note over an area of four inches in diameter from level of umbilicus dull. No friction notes heard. No definite mass made out. Leucocytes, 6000.

One hour after admission and nine hours after onset of symptoms of perforation, under ether, a three-inch incision—the centre being at McBurney's point—was made and deepened by intermuscular cleavage to the peritoneum, which was œdematous, and on opening about two ounces of turbid serum squirted out. Retracting towards median line, the congested ileum presented, more or less covered with fibrin. In its centre was a linear rent, one-half inch long. This was closed by a double layer of Lembert sutures. This lesion was about five inches from the ileo-cæcal junction and on the upper surface midway between the mesenteric and free border.

Examination of ten inches of the ileum proximal to the lesion showed several areas of central thinning with indurated margins and of lighter color than the parts surrounding them. The mesenteric attachment over the whole extent of gut examined was thickened, and at certain places, particularly opposite the perforation and the other several areas alluded to as probably

ulcerated Peyer's patches, this glandular enlargement was most marked and associated with a purplish color.

All evidence pointed to a localized peritonitis in the vicinity of the bowel first exposed, and search for additional perforations beyond the distance mentioned seemed not advisable. Two small cigarette drains were placed in contact with the centre of infection and the wound was slightly closed at extremities. Time of operation, forty minutes.

July 18. Patient in good condition. Facies placid, restlessness greatly diminished. Heart's action of better force; sounds of better quality. Respiration still rapid. No signs in lungs. Abdomen again distended, but no pain. Good movement, dark greenish, in response to enema. During the night tympanites was relieved by rectal tube. Temperature this morning, eight o'clock, 102° F.

July 19. Temperature continued 102° to 103° F.; pulse, 120 to 124; respiration, 26 to 34. Heart and lung action improving. Abdomen still distended, but always relieved by rectal tube insertion. No abdominal pain, no vomiting. Good result from enema. Patient quieted by cold packs, but temperature not much affected. Wound dressed. Had been a slight serosanguinous discharge. No pus or fæces. One cigarette drain removed.

July 20. Condition about the same. A systolic murmur heard over pulmonary aortic valves. Patient vomited beef-tea this morning. Good result from enema. No signs of hæmorrhage. Fluids taken fairly well. Leucocytes, 13,900; no Widal reaction. Meteorism continues.

July 21. Temperature continues 102° to 103.5° F.; pulse, 124; respiration, 30 to 40. No vomiting. Meteorism continues, but amenable to rectal tube. Wound dressed; discharge still slight; little pus along sides of drain. Iodoform gauze still left undisturbed.

July 22. Patient vomiting more. This morning the pulse is perceptibly softer, weaker, and smaller. Heart sounds of fair quality. Abdominal distention about the same as on previous days; no blood in stools. Temperature, 102° F.; pulse, 126; leucocytes, 6500. Widal negative.

July 23. Widal suggestive. This morning, during delirium, patient fell from his bed. Shortly afterwards pulse was very weak. Hypodermoclysis failed to improve it. Infusion was then

given with no appreciable reaction, and he died six hours after the fall. Necropsy was not permitted. Cultures made at time of operation gave rich growth of colon bacillus.

CASE III.—A woman, twenty-three years of age, was admitted to the Presbyterian Hospital, August 15, 1902, in the medical service of Dr. Tuttle. For more than two weeks she had had headaches and anorexia; otherwise felt well. One week ago she began to feel feverish. Had epistaxis, and this has been repeated two or three times a day ever since. Patient went to bed five days ago, much prostrated. No alternation of days.

The fever and prostration have grown steadily worse; has perspired freely. No chills. Anorexia complete; at times nauseated; has not vomited.

Bowels were regular up to five days ago, when they began to be loose. Four or five yellow-brown movements; no blood.

For past three days has had cramp-like abdominal pain across lower half of abdomen. Head has ached constantly; also back and knees. Felt very dizzy on attempting to get up. Has slept poorly; felt restless, but very heavy and languid.

Her abdomen was a little rigid. Slightly tender to deep pressure on right side. On the trunk and the abdomen were a few erythematous spots, not typically enteric.

On admission, temperature was 103.5° F.; pulse, 120; respiration, 24. Leucocytes, 9200. Widal negative. Seven days later Widal positive. During this week pretty continuous temperature, between 103.5° and 104.5° F., despite tub-baths averaging one every two hours. On eighth day after admission had hæmorrhage, four ounces. Baths discontinued and temperature ranged lower. Five days later another hæmorrhage. During next nine days there were ten hæmorrhages. Degree of pyrexia constantly declining, ranging between 99.5° and 103° F.

On September 6, three weeks after admission, at 4.30 P.M., she had an onset of severe pain in the lower right side of her abdomen, causing her to roll about. Pulse increased to 132 and temperature began to rise, and at 5.30 there was a distinct chill, and cyanosis noted in nails and lips. Pain continued intense and had extended across the lower abdomen. There were no rigidity, no tympany, no loss of liver-dulness, but distinct dulness over the entire lower abdomen, and excessive degree of firm retraction. Temperature continued to rise, and at 8 P.M. had reached

104.4° F.; pulse, 138. Patient had received three minims of Magendie solution and was much quieter, pain having almost disappeared. Marked tenderness, however, persisted over the infra-umbilical portion of the abdomen. Rigidity began to appear, and there was a little tympany over cæcal region and dulness on the left side in a corresponding position. At nine o'clock pulse was 130; leucocytes, 3600. Temperature had dropped to 103.8° F. About this time the writer saw the patient with Dr. Tuttle, and advised immediate operation for repair of a presumed perforation. Hypodermoclysis of 400 cubic centimetres salt solution was given.

At 11.30 P.M., seven hours after first signs of perforation, under ether, mainly because of marked tenderness and most dulness being noted in the left hypogastrium, a median incision of four inches was made. The bleeding was unusually free. On opening the peritoneum the omentum was found well down in the left flank. This was carefully drawn up and with two fingers placed under a loop of injected ileum both gut and attached portion of omentum were lifted out of the wound. While so held, without the slightest appreciable traction on either, they fell apart, disclosing a finger-nail-sized ulceration, but over which still spread some of the serous coat of the bowel. An oval slit or punctate spot in this attenuated membrane was blood-stained and represented the perforation. The yellowish-gray impression imparted to the omental surface was of the exact marginal size and round shape of the entire intestinal lesion, just as if there had been no partial intervening portion of visceral peritoneum.

There was a little free, slightly turbid fluid in the peritoneal cavity, and a few small flakes of fibrin attached lightly to near-by parts of the ileum. No blood. No fæces. The lesion was closed by a double row of interrupted silk Lembert sutures, and Cargile membrane adjusted over and beyond the site of the suture. The gut was then examined for about twelve inches above and below this lesion. Nearer the cæcum the omentum was found attached to the gut over a space twice the extent of the lesion already dealt with. This was so firm as to give the impression that Nature had here utilized the omentum so efficiently in anticipation of a perforation that to sever it and substitute suturing was uncalled for, if not unjustifiable. In the opposite direction another small ulcer was met which seemed to be fairly close upon the serous

surface. This was reinforced with a layer of Cargile membrane. The peritoneum was closed with catgut, and the individual parietal layers with interrupted chromic gut. No drainage. Time, thirty-five minutes.

During the night at intervals patient vomited greenish fluid. Next morning, temperature was 100.5° F.; pulse, 130, of good quality. Abdomen soft; a little retracted. Feels fairly comfortable and in good spirits. Leucocytes, 6200. From now on until convalescence was established, twenty-six days later, there was a persistently lower temperature and better pulse-rate than on any single day previous to the operation. No blood was subsequently seen in the stools. Leucocytes varied between 3600 and 5000.

Three weeks after operation large quantities of pus appeared in the urine, and much more albumen than the pus would ordinarily account for, but casts were not found. Patient was discharged cured on the fortieth day after operation and sixty-three days (nine weeks) from onset of disease.

Cultures made at operation gave pure growth of colon bacillus.

NOTE ON THE FREQUENT GREAT DISPARITY
BETWEEN FALLS UPON THE BUTTOCKS AND
THE SUBSEQUENT PERSISTENT PAIN AND
IRREMEDIABLE HELPLESSNESS IN PERSONS
IN ADVANCED YEARS.¹

BY OSCAR H. ALLIS, M.D.,
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It is well known among the members of the medical profession that very trifling injuries are sufficient to produce fracture of the neck of the femur, and it is quite as well known that the results of these simple injuries vary greatly,—that in one case a good and useful limb will be obtained, while in another total helplessness will result. The fact that in one case satisfactory results follow treatment and in another under similar treatment pain and total helplessness, leads patients and their friends to reflect upon the skill of the respective surgeons, and has led many a surgeon to have confidence in a line of treatment that greater experience would show to be premature and ill founded. In the following remarks I shall not dwell upon the subjects of diagnosis and treatment, but will confine myself to the topic under consideration, and offer a few reasons for the pain and helplessness, and suggest a remedy for it.

I will first give brief histories of cases that have been victims of pain and helplessness until relieved by death; second, report similar cases that have recovered with useful limbs; third, will give the pathology of a few cases that I have posted or operated upon, and conclude with surgical procedures for its relief.

CASE I.—Mrs. W. H., widow, seventy-nine years of age, active and in apparent good health, arose from her bed at mid-

¹ Read before the Philadelphia Academy of Surgery, October, 1902.

night, tripped in her night-dress and fell to the floor. The immediate pain and helplessness were the occasion of my summons. I found her with shortening, eversion, relaxed fascia lata, and excessive pain and helplessness. These being the signs and symptoms of fracture of the neck, she was immediately made as comfortable as possible, and, to prevent the formation of bed-sores, her position was changed, her bed kept as free from pollution as a dribbling bladder would permit. Efforts to move her were attended with pain, and when it was deemed proper to get her out of bed and sit her up, the pain was greatly increased. She lived four years, and was a helpless sufferer during the entire period.

CASE II.—Mrs. G., sixty-five years of age, was growing feeble from paralysis agitans, but otherwise not a sufferer. While sitting in a low rocking-chair she slipped to the floor; the fall was accompanied with so much immediate pain and helplessness that I was summoned. All the signs of fracture of the neck of the femur were present. The pain from the time of the original injury to her death, which occurred six years afterwards, necessitated day and night watches to turn and relieve her position.

CASE III.—Miss B., aged sixty-six years, arose from her bed and through some entanglement was pitched forward upon her hands and knees. She said that if her thigh had been made of glass, it would have broken, as she thinks her thigh was broken. All the symptoms of fracture of the neck of the femur were present. She was gently moved about in bed and no bed-sores resulted. It is now six years since the injury. She can barely stand alone, and is practically helpless, though in comparatively good health.

In none of these cases was there any attempt at treatment. The effort on my part being to avoid bed-sores and to make the patients as comfortable as possible. To show that the bad results were not due to faulty treatment upon my part, I will give three cases as nearly parallel as possible.

CASE IV.—Miss R., aged sixty-three years, fell in the yard; as it was in winter, the pavement might have been slippery. I saw the case with Dr. Franklin Mathews a few days later. He had diagnosticated fracture of the neck of the femur, but had

not made a thorough examination, deferring it, if necessary, until I came. All the signs were so clear that no further examination was made. She had received no treatment save that of making her comfortable in bed. After my examination, she said, "I do not know why you advise my staying in bed. I am as well as ever except this bruise." She was not told her hip was broken. She was helped out of bed the second week, and in due time walked with crutches, then without them, going to visit friends and to church. An autopsy several years later confirmed the diagnosis.

CASE V.—Clergyman, aged seventy-eight years, was knocked down by a passing carriage; was rendered helpless and brought home in conveyance. Fracture, neck of femur. Was gotten out of bed second week. Soon moved about on crutches, and later went into the pulpit, with a number of steps to ascend, and preached an old-fashioned—which means a long—sermon. He was indeed proud of his achievements upon his broken thigh.

CASE VI.—Mrs. G., widow. Though suffering from paralysis agitans, she was able to go about. Was struck by a wagon and knocked down. Every sign of fracture of the neck of the femur present. Confinement for a few days revealed a forming pressure sore and special treatment abandoned. She was made comfortable. No particular attention was paid to her fractured thigh. Gotten on to her side and propped with pillows to relieve pressure on her buttocks. Later out of bed. She recovered, and had a useful joint, going up and down stairs and all about her house without the use of crutch or cane.

As the only treatment in these cases was to make the patients comfortable, and to avoid pressure sores by changing their position in bed several times a day, some might infer that had extension been made or long splints been used the results would have been better; but I have been careful to give an equal number of the two classes,—the first of great and permanent sufferers, and the second with but little pain and recovery with useful limbs.

To make my point more emphatic, I add the history of a case treated by Dr. Walter C. Stillwell.

CASE VII.—Mrs. C., aged sixty-seven years, fell in the yard; was treated with extension and lateral supports for eight weeks, during which time there was no pain. She was then permitted to get up, when the pain commenced, and continued until she died six years later, during all of which time she had been obliged to sit in a chair night and day. The injured limb swelled greatly, and the distention, no doubt, caused much of the pain.

The different results from trifling injuries—for such falls as I have described are comparatively trifling—must be due to very different conditions present. These may be considered under the following heads:

First. Osteophytes may spring up about the injured joint, or fragments of bone from the original injury may become fixed like stalactites and pierce the tissues. Such a condition I found present at the autopsy in Case I.

Second. The fall may in one instance produce concussion of the joint. In experimental work, I have found that when great pressure has been exerted against an articulation, in some instances the cartilage has been depressed, cracked, and distinctly broken. Although in fractures of the femoral neck the yielding of the bone under comparatively slight injury would preclude a concussion or severe injury to the joint, yet in autopsies, after years of suffering, I have found evidence of a mild subacute arthritis that accounted fully for the pain. In one instance in which I was permitted to operate five years after a fracture of the femoral neck, I found no evidence of active degeneration of the articulation, but the head and socket both showed large areas of absorbed cartilage and denuded bone.

Third. The sciatic nerve may at times be pinched or torn. I know of no facts to warrant this statement. There are facts that show that this nerve is injured by dislocations. Autopsies show that blood has been effused into the sheath of this nerve, and the same has been lacerated and torn in two. It is also known that paralysis has followed either injury to the nerve from dislocation or from injury in attempts at replacement. In one case of a comparatively slight fall backward, the patient

experienced no great pain, and was able to get up and go into her kitchen. The pain arose while she was in a sitting position, and soon became so violent that she could not move the limb without pain. An examination under ether revealed no bone lesion, and the conjecture was that the sciatic had been bruised.

Fourth. The ligamentum teres may be torn. Of this I have no positive evidence. In one autopsy to examine a fractured hip it was either congenitally absent or absorbed. I have in experimental work torn the ligamentum teres without dislocating the head of the femur.

In regard to treatment, I have little to offer. In one case I removed the fragment of the head of the femur five and a half years after the injury because the patient had suffered pain night and day all these years and could endure it no longer. As the patient was sixty years old, with atheromatous arteries, the fact that no brilliant result followed may not be wholly attributed to the operation. The pain is much diminished, none at all at times, and locomotion gradually improving.

If an operation be undertaken, it is reasonable to think that it should be indicated by the persistency of pain,—after one or two months. There are few surgeons who would think of removing the fragments of a broken femoral head and neck without first seeing what effect treatment would bring about, but after one or two months of continuous pain, surgical interference is warranted, provided the patient's age and strength will permit.

HYGROMA AND FIBROMA OF THE TUBER ISCHII BURSÆ.

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OF CHICAGO,

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IN the Von Bruns-Mikulicz "Practical Surgery," Professor Hoffa, of Wurzburg, says on page 183, Chapter vii, under Diseases of the Bursæ of the Hip, after speaking of the inflammatory affections of the more common bursæ, "That there is little to be said of the rest of such bursæ involved, inasmuch as few such cases are known of or have been described. If one knows the exact anatomical location of the bursa, then it behooves us to relax the overlying muscles, to make fluctuation apparent, and to gain some idea of the surface and etiology, and, finally, make an exploratory puncture." Hygroma of the tuber ischii bursæ, according to König, occurs mainly in people who, through their vocation, are compelled to irritate the parts by sitting a great deal.

Dr. O. von Büngner, assistant to Von Volkmann in the Surgical Clinic at Halle, describes a case under the title of "Ueber ein enormes, mit grossen Fortsätzen versehenes Hygrom des Scheimbeutels auf dem Tuber ossis ischii" in the *Berliner klinische Wochenschrift*, in which he states that, although disease of the bursæ of the hip and gluteal region, namely, the subiliac and trochanteric, are occasionally brought to the notice of every busy surgeon, the hygroma of the tuber ischii is of the greatest rarity. In the surgical works it is seldom alluded to. Roser, in his "Handbook of Surgical Anatomy," says, "The bursæ over the tuber ischii may be developed into large tumors or abscesses, and he later states that this form of hygroma may be occasioned by vocations compelling a continued irritation of the nates in sitting. They lie so deeply that one is apt to mistake them for solid instead of fluctuating masses. Von Büniger also states that he has only

found allusion to such an affection in Von Volkmann's *Krankheiten der Bewegungsorgane*, and in W. Heineke's monograph, "The Anatomy and Pathology of Bursæ and Tendon Sheaths."

Volkmann cites Cloquet, who saw such a bursa distended to the size of an adult head, and Heineke cites Velpeau, who found a sanguinolent fluid in such a sac. Outside of these cases he found none in the literature, except one case of Dupont's, which was inaccessible to him. The author states, Wherein lies the great rarity of this affection? To answer the question, he endeavored to find the frequency of the normal development of this particular bursa, and consequently consulted Volkmann, Professor Wenzel Gruber, of St. Petersburg, and Heineke, the foremost authorities on this subject, who came to the conclusion that the bursæ of tuber ischii is inconstant, and only found in a very few cases; and not alone this, but being protected from injuries by the soft parts, are much less liable to this transformation than other bursæ in the neighborhood.

Ziegler, in his "Special and General Pathology," on p. 263, says, "The bursæ, which are generally developed in connective tissue, are structures made up of a connective-tissue capsule, whose inner surface is generally smooth and contains a clear synovial fluid. They are found generally where muscles or tendons run over bony prominences, or where the skin, fascia, and muscles are continually subject to pressure or displacement. They are consequently acquired structures, and hence some are inconstant." In the acute inflammations of the bursæ, called acute bursitis or acute hygroma, we find the contents according to the form of inflammation serous, or serofibrinous and pus, which dilate the sac, so as to give rise to a fluctuating tumor. The inflammation arises most frequently from contusions, wounds, and pressure, and is seldom due to infection from the blood. Purulent inflammation may invade the surrounding parts.

The chronic form manifests itself generally by an accumulation of fluid in the bursal sac. At first the fluid is of a

mucoid character, stringy, and later it becomes thinner and loses these characteristics.

The majority of hygromata reach the size of a fair-sized apple, although they may exceed this; the most frequently involved being the prepatellar bursa. In case of a communication of the bursa with a joint, we also find an excess of fluid in the joint.

The sac of the hygroma is generally thin, but from continued irritation may become immensely hypertrophied and in part calcified. In cases of gout we may have deposits of uric acid, and occasionally we may have from the start a hypertrophy of the sac with a very small quantity of fluid. We may also find present in the sac corpuscula oryzoidea, or rice bodies, as are found in the ganglion of tendon sheaths, which consist of layers of homogeneous masses and spindle-cells formed by a coagulation process and interspersed with cells, which become organized to a certain extent according to Volkmann, and occasionally connected with the wall of such hygromata are found papillomatous excrescences, whose pedicle is made up of a delicate thread of connective tissue, holding in suspension such a rice body, which may become separated and form a free body. Upon pressure in such a ganglion filled with a number of such bodies, we get a peculiar sensation of crepitus, hence they are known as ganglion crepitans.

In rare cases developed from the wall of hygroma we get cartilaginous bodies, which resemble the so-called foreign bodies of joints, when they become free. Their size varies from that of a pea to a chestnut.

In cases of hygroma we may also have hæmorrhages due to trauma or circulatory disturbances, in which there is more or less of a fibrinous deposit; these are known as bursæ hæmatoma. Tubercular inflammation of bursæ may occur secondary as well as primary. The development of tubercles in the wall of the bursal sac may be accompanied with a serous exudation, and this form is known as hygroma tuberculosum. In the further development of this form, the inner surface of the sac may become the seat of fungous granulations, while the sac

wall in general is thickened and interspersed with tubercular foci of granulation tissue, which later may undergo cheesy degeneration. A. Müller, in his Inaugural Dissertation entitled "Ueber Bursitis ischiadica," states that up to 1895 only six cases of the kind had been reported, the first cases by French surgeons. Other works on this subject, such as that of A. Manz, "Beitrage zur entstehung der Reis Koerperchen mit besinderer, Berücksichtigung der schleimbeutel hygrome," P. Mannsburg, "Schleimbeutel Hygrome in der Beckengegund," were inaccessible to me.

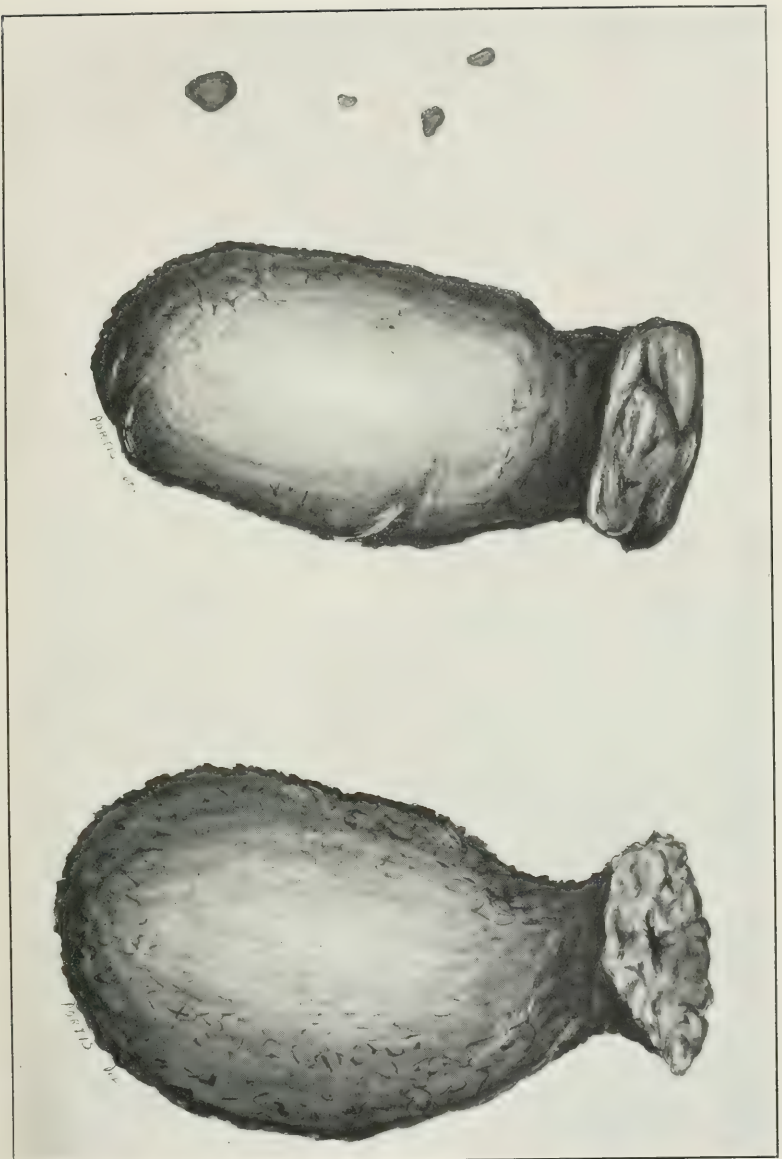
E. Kuster, "Hygroma bursæ tuberis ischii," *Med. Chir. Centralblatt*, Wein, 1882, xvii, 532, gives the history of two cases operated upon by himself, in which the etiology of the second one corresponds to a certain extent to that of my own, inasmuch as the patient, six weeks previously, had received a severe contusion of the gluteal region while in the saddle, riding a mule.

It is due to the fact that so few such cases have been recorded that I report the following cases. I am inclined to think that these are the first cases to be reported in America.

H. W., aged fifty years; occupation, butcher; nationality, English, presented himself at my surgical clinic at Rush Medical College, Out Department, early in April. He was sent to the Michael Reese Hospital, where on April 24 I operated upon him.

His history reads as follows: For the past fifteen years he has had several hard, indurated nodules on both buttocks, varying in size from that of a marble to that of a walnut. These masses never caused him any inconvenience until quite recently. For twenty years he had been in the saddle more or less, being a ranchman on the plains in the West. A short time ago he endured severe hardships, being compelled to walk long distances, and since then he has experienced pain and distress when he moves his limbs and while sitting. No other nodules are to be found elsewhere on the body, no constitutional symptoms. Both limbs were slightly swollen a few weeks ago, but at present no œdema is noticeable.

In the gluteal region on both sides, almost directly overlying



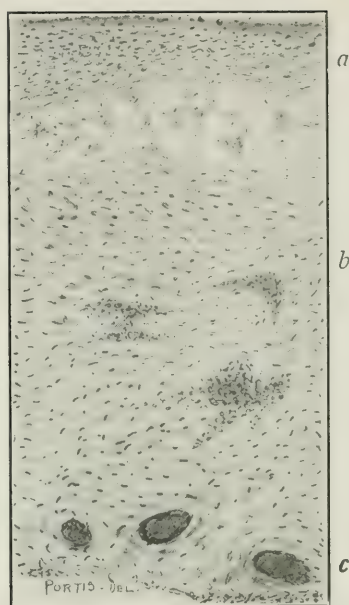


FIG. 2.—Low power. *a*, external layer; *b*, middle layer; *c*, internal layer.

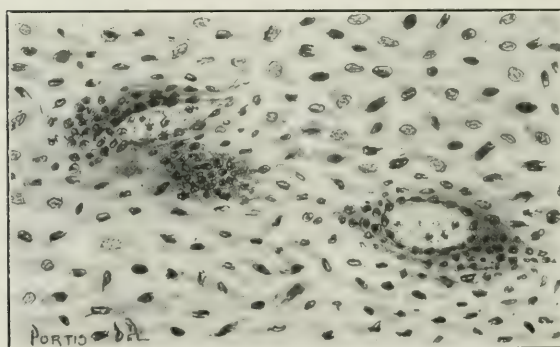


FIG. 3.—High power. Internal layer.

and to either side of the tuber ischii, are found prominent masses of several very hard, almost cartilaginous-like nodules, irregular, giving a grating sensation on the right side, while the left in parts gave the sensation of fluctuation, and both appeared to come from a deep, long attachment and be adherent to the skin. They were removed without much difficulty, and found to be firmly adherent to the tuber ischii. (Fig. 1.) During the operation, by too strong tension of the vulsellum forceps, both sacs were ruptured slightly, permitting of an escape from the right one of a half-teacupful of rice bodies, from the left one a serous, dark, bloody fluid.

The greatly dilated and hypertrophied connective-tissue capsule in both specimens are traversed by connective-tissue bundles, such as we find in true fibroma. The right one contained no less than a teaspoonful of rice bodies, while, as previously stated, the left contained an equal amount of serous, bloody fluid. Cross sections of each bursal sac were taken, hardened in alcohol, mounted in celloidin, and stained firstly in lithian carmine and, later, with Weigert's fibrin stain.

The sections showed the following microscopic picture: Three layers were to be distinguished, and the general characteristics of each correspond closely to the sections of both Müller and O. Büngner. First (Fig. 2, *a*), the external layer is composed of dense connective tissue which contains numerous round cells interspersed between some of the connective-tissue fibres, and has markedly compressed the fat tissue beneath. Small vessels are occasionally found in this layer, but mainly devoid of contents, although surrounding the same we find evidence of former extravasation from the vessels in the form of pigment.

Middle layer (Fig. 2, *b*) is composed mainly of a round-cell infiltration, interspersed between looser connective-tissue bundles and fat tissue, stained more or less with blood pigment.

Internal layer (Fig. 2, *c*, and Fig. 3) is composed of connective-tissue fibres, very rich in blood-vessels, which are considerably distended with blood-corpuscles. These lie more superficial in this layer, and are surrounded by evidences of extravasation. The cells described by Müller in this layer as containing a small amount of protoplasm, with a long round or ovoid vesicle-like nucleus, are to my mind artefacts due to the teasing of the connective-tissue fibres asunder.

This layer also contains isolated in the neighborhood of the blood-vessels a considerable number of red and white blood-corpuscles, with blood pigment between the vessels. This is shown nicely in the accompanying drawings of the microscope sections. Although the surface of this layer does not show an endothelial layer or lining, yet in numerous places one finds areas which correspond to fibrinous deposit from recent hæmorrhage, and these undergoing an attempt at organization, as shown by the connective-tissue bands which lead to the underlying parts. These areas are shown in the slide as having taken the aniline gentian violet stain more deeply, and have become less decolorized than the surrounding tissue.

Interspersed in this tissue we find emigrated leucocytes.

The whole is a perfect picture of hæmorrhagic inflammation.

The hæmorrhagic contents found contained in one sac is composed of blood- and pus-corpuscles. Microscopic examination of a number of the rice bodies showed lamellated layers of organized fibrin, although absolutely no indication of the miliary tubercle or tubercular tissue in general, and no tubercle bacilli, for which a number of specimens were stained.

In conclusion, I wish to say that about two years ago a middle-aged man presented himself at my surgical clinic in the Michael Reese Hospital, who presented a very similar condition. I operated upon him, and found an arborescent form of fibroma present, which probably arose from the bursæ, but the bursæ were more or less obliterated, leaving no apparent vestige of its former self, but instead a branched form of fibroma, whose main trunk came from directly over the tuber ischii.

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BLANK-CARTRIDGE WOUND INFECTED WITH TETANUS BACILLI; PROMPT EXCISION; NO TETANUS.

FROM THE CLINICO-PATHOLOGICAL LABORATORY, MASSACHUSETTS GENERAL
HOSPITAL.

BY JOHN BAXTER BAIN, M.D.,

Interne in the Massachusetts General Hospital.

THE object of reporting this case is to show the value of early operation in wounds infected with tetanus bacilli.

The patient was a girl, aged thirteen years, who, while playing with an older sister, was accidentally shot in the palm of the right hand with a blank cartridge on July 3, 1902.

Immediately after receiving the injury, the patient's mother washed out the wound with warm water and sent her to the Accident Room of the Massachusetts General Hospital, in the service of Dr. Samuel J. Mixter. On her arrival, examination showed a punctured wound in the palm of the right hand near the ulnar border, about the size of a ten-cent piece, blackened at its edges, and surrounded by an area of powder-stained tissue. The wound was cleaned with soap and water, chlorinated soda (1 to 15), and corrosive sublimate (1 to 1500), and the following operation was performed about fifty-five minutes after the injury by Dr. Beth Vincent, an interne in the hospital.

A tourniquet was applied to the forearm, and an elliptical incision was made about the wound of such extent as to include the powder-stained area with a margin of normal tissue. Powder grains were found embedded in the muscles, tendon sheaths, and nerves. All such tissue was carefully resected, the dissection being carried down between the third and fourth metacarpal bones as far as the fourth dorsal interosseous muscle. The wound was then douched out with corrosive sublimate, 1 to 5000, a wick was inserted, and its edges were partially approximated with silkworm-gut sutures. It was drained for twenty-four hours, and at the end of this time the wick was removed. Under the ordinary

antiseptic precautions, the wound healed with great rapidity, and the patient was discharged well in a month.

The patient was seen on September 26, 1902, and found to be perfectly well, never having had any symptoms of tetanus. The wound was healed, leaving a small linear scar about three centimetres in length.

All the tissue removed at the operation, together with the particles of wadding and powder grains found in the wound, were placed in a culture tube of coagulated blood serum and sent to the Laboratory to be examined for tetanus bacilli. After three days in the incubator, a considerable growth of bacteria had occurred in the tube, examination of which showed numerous micrococci and bacilli. Some of the bacilli had spherical spores situated at one end, and were identical with tetanus bacilli in appearance. These were isolated in pure culture by means of anaërobic plate cultures and were found to be true tetanus bacilli. They presented the following characteristics:

Colonies twenty-four hours old in glucose agar, under lower power of the microscope, were seen to consist of interlacing filaments with a somewhat granular centre, the filaments extending out into the surrounding medium in a more or less radiate manner.

Stab cultures in glucose agar from these colonies showed a grayish white streak along the line of inoculation at the end of twenty-four hours, which grew to within a few millimetres of the surface of the medium. A diffuse lateral outgrowth gradually took place from this grayish white streak, so that at the end of two or three days the medium had a hazy appearance. A small amount of gas developed, and the culture gave rise to a peculiar foul odor.

In tube cultures under anaërobic conditions by Wright's method (*Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, I. Abtheilung, Band xxix, No. 2, 1901), the bacillus showed the following characteristics:

Surface of coagulated blood serum: Very feeble growth without liquefaction of the medium.

Litmus milk: Feeble growth without visible change in the medium.

Bouillon, reaction + 1.0: Diffuse cloudiness after twenty-four hours in the incubator. Later, a viscid, grayish sediment collected at the bottom of the tube. No surface pedicle.

The bacillus produced spherical spores, situated at one end and was like the tetanus bacillus in morphology. It stained by Gram's method.

Inoculation experiments with animals gave the following results:

Two mice, inoculated subcutaneously, after twelve or fifteen hours developed paralysis of one hind leg, which was soon followed by a similar condition in the other. With both legs paralyzed and lying extended, they would attempt to go about dragging them, which is so characteristic of experimental tetanus in mice. This condition was followed by opisthotonus, convulsions, and death in from twenty-four to thirty-six hours. Two guinea-pigs died in from thirty-six to forty-eight hours, after subcutaneous inoculation, with all the signs characteristic of tetanus in these animals.

In brief, the organism isolated in this case presents all the morphological, cultural, and pathogenic properties which are characteristic of the tetanus bacillus, and with which we have become familiar by the study of tetanus bacilli isolated by us from undoubted cases of human tetanus.

To the best of our knowledge, this is the first case in which tetanus bacilli have been isolated from a wound without the occurrence of symptoms of tetanus in the patient.

In the course of the last six years, material from at least forty-six blank-cartridge or similar wounds has been examined for tetanus bacilli in this Laboratory, and in none of these was the organism found unless tetanus was present.

It is, therefore, highly probable that, if it had not been for the prompt cleansing and excision of the wound in this case, symptoms and signs of tetanus would have developed in the patient. The interval which elapsed between the accident and the operation was probably so short that there was not sufficient time for the organism to develop or elaborate any tetanus toxin.

This case should furnish a strong argument in favor of the early and complete excision of all wounds which from clinical experience are likely to be followed by tetanus, especially those arising from blank cartridges.

DISLOCATION OF INDIVIDUAL CARPAL BONES, WITH REPORT OF A CASE OF LUXATION OF THE SCAPHOID AND SEMILUNAR.¹

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IT is the purpose of this paper to direct attention to a form of dislocation hitherto considered to be rare, and mentioned briefly, if at all, in most treatises on surgery. Rare indeed, but probably often mistaken for something else, namely, Colles's fracture of the radius. The matter is worthy of consideration, because these dislocations have been and will be mistaken and treated as sprains and fracture. It is important to recognize the condition early, for there is a chance then, if ever, of making reposition. Older cases associated with disablement of the hand, and the sequelæ of nerve pressure, may be greatly improved by operation. I will not estimate how many cases there are to-day nursing an old alleged "fracture of the radius," with "poor union," or "callus formation," with a more or less stiff wrist and powerless grasp of the hand. By means of the Röntgen ray, and by operation, a number of these obscure "fractures" have been cleared up and correctly diagnosed.

Dennis' "System of Surgery" and Wyeth's "Text-book" make no mention of the subject.

"Isolated dislocation of every one of the bones of the carpus, except the cuneiform, has been reported. The semilunar is the one most frequently dislocated, the injury having been compound in half the cases reported, and the displacement forward in all but one." "American Text-book of Surgery."

"The os magnum is the only one of the carpal bones likely to be displaced. This bone is occasionally displaced backward, so that it is prominent on the dorsum. The bones of the

¹ Read before the Chicago Surgical Society, November 3, 1902.

carpus are closely bound together and are not often displaced, though a few cases of dislocation of the second row from the first are reported. This injury is usually an accompaniment of a crushing injury which breaks the bones and lacerates the soft tissues." Park's "Surgery by American Authors," Vol. i, p. 765.

"The scaphoid and semilunar have also been seen to be dislocated, usually in compound injuries." "International Text-book of Surgery," Vol. i, p. 632.

"We hardly ever observe dislocations of one carpal row on the other, but single bones of the carpus may be displaced, and form an abnormal projection on the dorsum of the hand." Helferich "On Fractures and Dislocations," Translation. Third Edition. London, 1899, p. 105.

"The carpal bones seldom become displaced except in gunshot wounds, or in connection with extensive lacerations and fractures of the neighboring parts. Simple dislocations, or rather subluxations, of these bones do, however, occasionally take place, but, so far as I have been able to ascertain, except in the case of the pisiform, only in one direction, namely, backward. The bones of the carpus, which are said occasionally to have suffered simple backward subluxation, are the semilunar, cuneiform, and pisiform of the first row, and the trapezium, magnum, and unciform of the second row. I have found no account of an example of simple dislocation of single carpal bones except in the cases of os magnum, pisiformis, and lunare, as above mentioned." Hamilton, "A Practical Treatise on Fractures and Dislocations," Eighth Edition, 1891, p. 661.

The above is practically all that is mentioned on this matter by the authors quoted, and, although all are of comparatively recent date, it will be obvious from the following that all, except the "American Text-book," admit of more or less revision.

Tillmanns⁴⁵ and König²⁰ contain a brief summary; but the "Handbuch der Praktischen Chirurgie," by von Bergmann, von Bruns, and von Mikulicz⁴⁶ contains a concise yet comprehensive *résumé* of the subject.

In Stimson's "Treatise on Dislocations," 1888, p. 367, is found a very complete article, with literary references to date of issue; it is the fullest description contained in any text-book.

The history of my case of simple complete anterior luxation of the scaphoid and semilunar bones is as follows:

C. F., aged twenty-five years, painter. History previous to accident negative; always healthy and well. June 12, 1902, while at work on a scaffolding, he lost his balance and fell a distance of four stories, his fall being interrupted by several obstructions before, with hands extended, he finally struck the ground. He was taken in an unconscious condition to the hospital, where it was found that, except as to his right arm, he was practically uninjured. The injury of the arm was diagnosed "fracture of the lower end of the radius," and the member was put up in splints.

In July, on my assuming the surgical service, I first saw the patient. It was then four weeks after the accident, the splint had been but recently removed, and the patient was still complaining of disability of the right wrist and hand.

On examination, the fingers are found to be held somewhat flexed (*en griffe*); he cannot pick up any object, neither can he make flexion nor extension of the fingers. On passive motion, however, the fingers can be extended and pretty fairly flexed, but the movements are painful. Pronation and supination are free, both active and passive. Active and passive motion at the wrist is very much restricted. The hand is practically useless to the patient, even as regards the simplest manipulations.

There is a bluish scar at the middle of flexure of wrist about two centimetres in extent; the dorsal surface of the wrist and forearm presents no abnormality. On the palmar surface of the wrist, and to ulnar side of the median line, is noticed an oblong swelling, about four by two centimetres, whose upper pole can be more readily outlined than the more deeply situated lower end.

The lower pole of the mass cannot be outlined definitely, owing to the superimposed flexor tendons. The upper extremity is rounded, extending about four centimetres above the level of styloid process of the ulna. The proximal (upper) extremity of the mass is slightly movable; the distal end is so deeply embedded that it is hard to say if any motion can be imparted to it or not.



FIG. 1.—Dislocation of scaphoid and semilunar bones, lateral view.



FIG. 2.—Dislocation of scaphoid and semilunar bones, anteroposterior view. Right hand.

In consistency it is hard and resistant; no fluctuation. Palpation of the ulna presented no abnormality, nor any evidence of previous fracture. The same was true of the radius as far as it was accessible to touch. No sensory disturbances of the fingers, but considerable atrophy of all the small muscles of the hand, and some atrophy of the forearm.

A skiagraph (Figs. 1 and 2) at once revealed the true nature of the trouble, and clearly showed that we had to do with the displacement of two bones, the scaphoid and semilunar, to a place far distant from their original location. To replace the bones by manipulation was obviously entirely impossible; they had become far displaced from their fellows in the carpus, and certainly at the expense of all ligamentous attachments; they were more or less fixed in their new location, and who could venture to replace them in their exact normal relations?

They were undoubtedly an impediment to motion, especially to flexion of the fingers and of the wrist, and could henceforth be regarded as foreign bodies, and their removal seemed clearly indicated.

A longitudinal incision two and one-half inches long was made midway between the tendon of the palmaris longus and the flexor carpi ulnaris. After dividing the fascia, the tendons of the flexor sublimis digitorum and the flexor profundus digitorum were drawn to the radial side by a blunt hook. The flexor carpi ulnaris together with the ulnar artery and nerve were retracted in opposite direction. The bones were easily accessible, lying on the pronator quadratus. The semilunar was more deeply situated and nearest to the wrist-joint; it was still partially attached by ligaments. The scaphoid was more superficial and was attached to its fellow by a few bands. Both bones were easily enucleated, after which the wound was closed by silkworm-gut sutures. Wound healed by primary union. There was no evidence of pressure on or stretching of nerves.

Subsequent History.—Although the condition of the wrist has improved considerably since removal of the bones, it is yet far from perfect. Formerly the hand was useless; now he is at work again, and able to use a brush, and grasp objects. He feels that the hand is becoming stronger and more useful week by week.

There is still considerable atrophy of the muscles of the hand, but the condition is improving. Active and passive motion at

the wrist is still very much restricted, due to the absence of the two carpal bones. This has improved slightly, but will of necessity never approach normal. This need not, however, materially interfere with his occupation. The hand can scarcely be extended above the horizontal, and flexion is also much restricted, the whole range of motion being about forty-five degrees. As at the time of operation no nerves were found involved by pressure or otherwise, it is probable that the persistent muscular atrophy of the hand is due to contusion of the nerves supplying these muscles.

By searching for and verifying all references in the literature, beginning with Seeger¹ (Schmidt's "Jahrbücher," 1834), I have been able to collect in all fifty-three cases, to which my own is added. This does not include the sublaxations of the os magnum. There is only one case of complete dorsal dislocation of the os magnum on record, found in Cooper.² Cases of partial backward dislocation have been observed by Seeger, Cooper, Richerand,³ Bonnes,⁴⁷ Chopart, Boyer, Chelius, Rich-ter, and others. They are not rare, and are produced through hyperflexion of the hand (fall, or striking with clinched fist), or are the result of certain occupations, *e.g.*, weavers. Reduction is accomplished by making extension of the hand and pressing on the projecting head of the bone. It must be held in place, however, for the deformity easily recurs. No case of palmar dislocation has ever been reported, and it probably does not happen, for anatomic reasons.

The following is a tabulation of the cases reported, and the bones involved.

Semilunar. Total, twenty-three cases.

Simple dorsal dislocations. Erichsen.⁴

Simple palmar dislocations. Taaffe,⁵ Chisholm,⁶ Cameron,⁷ Gamgee,⁸ Berger,⁹ Folet,¹⁰ Eigenbrodt (four cases),¹¹ Stoffel.¹²

Compound palmar dislocations. Mougeot,¹³ Holmes,¹⁴ Hodges,¹⁵ Gross and O'Hara,¹⁶ Albertin,¹⁷ Buchanan,¹⁸ Körte,¹⁹ König,²⁰ Bardenheuer,²¹ Maligne (quoted by Albertin),¹⁷ Berger.⁹

In seven of the simple luxations the bone was removed by



FIG. 3.—Normal wrist. Left hand of the patient, in whose right was the dislocation of carpal bones.

operation, viz., Chisholm, Gamgee, Cameron, Berger, Folet, Eigenbrodt (two cases).

Of the compound luxations, Holmes's case fell from a great height, and was instantly killed; both wrists were involved, and are preserved in the Museum of St. George's Hospital. Both wrist folds were torn widely open, and the semilunars are seen in the ragged wound, hanging by a few shreds of tissue. Hodges's case died of sepsis; Albertin's, of tetanus. Buchanan's was infected, the arm amputated, and the patient recovered. The displaced bone was removed in all of the remaining cases, and the patients recovered, sometimes with a good result.

Scaphoid. Total, seven cases.

Simple posterior dislocations. Smith,²² Weber,²³ Stewart,²⁴ Elkington (quoted by Cooper).²

Compound posterior dislocations. Fagg (quoted by Tilmann).⁴⁸

The cases of Nancrede²⁶ and Lembke²⁷ I cannot classify, as the original reports were not accessible to me. Auvray²⁸ reported a case of fracture of the scaphoid, with dorsal dislocation of one of the fragments. No case of displacement to the palmar surface is reported.

Scaphoid and Semilunar. Total, five cases.

Compound anterior. Fayne,²⁹ Forgue.³⁰

Simple anterior. Stoffel,¹² Potel,³¹ Dubar (quoted by Potel).³¹

Dubar removed the bones by operation. In Stoffel's case the scaphoid was also fractured.

Pisiform. Total, five cases.

Erichsen,⁴ Gras,³² Barois,³³ Fergusson,³⁴ and Bieberbach³⁵ reported cases in which this bone was displaced upward; the usual cause assigned was excessive muscular action of the flexor carpi ulnaris.

Trapezium. Total, four cases.

Uhde,³⁶ Mosengeil,³⁷ Alquié,³⁸ and Bieberbach.³⁵

All were simple dorsal dislocations, and were reduced by manipulation and pressure.

Trapezoid. Total, four cases.

Sheldon,³⁹ Gay,⁴⁰ Weber (two cases).²³

The cases of Sheldon and Gay were simple dorsal luxations, caused by striking a blow with the fist. In neither case could the bone be completely reduced, nor was the usefulness of the wrist materially interfered with. Weber's two cases admit of some doubt as to the diagnosis.

Unciform. Total, three cases.

Buchanan:⁴¹ a case of simple anterior displacement, reduced by pressure.

Eigenbrodt:¹¹ simple posterior displacement, complicated by fracture of the bone.

Oberst⁴² (original article not accessible).

Scaphoid and Os Magnum.

Morris:⁴³ patient's hand caught in machinery; simple dorsal luxation; reduced; good function afterwards.

Trapezoid and Os Magnum.

Uhde:³⁶ simple posterior dislocation; could only be partially reduced; poor functional result.

Fracture of the radius occurred as a complication in five cases, viz., Elkington, Cameron, Buchanan, Gross and O'Hara, Berger.

Pressure on the ulnar nerve was observed by Berger (two cases), Folet, Eigenbrodt, and Dubar. There was tingling, numbness, or anæsthesia involving the little and part of the ring finger, and atrophy of the interossei and thenar and hypothenar eminences.

The median nerve was implicated in the cases of Cameron and Gamgee. There was atrophy of the ball of the thumb, and sensory disturbance of the palm of the hand and first three fingers. In all cases relief followed operation.

Etiology.—Hönigschmied⁴⁴ made some valuable experiments on the cadaver to explain the mechanism of wrist-joint injuries. Of nineteen cases where forcible hyperextension of the hand was made, a fracture of the lower end of the radius occurred in seventeen. In two there was no fracture, but only

a rupture of the anterior ligament of the wrist-joint, with anterior dislocation of the semilunar. In thirteen of the seventeen specimens of fracture, there was no other injury present but that named; in four there was either a fracture of carpal bones or styloid process, or more or less extensive rupture of ligaments.

Eight times a preliminary dissection of the wrist was made before subjecting it to forcible hyperextension. Five times the palmar capsule was lacerated; twice the scaphoid was partially dislocated, and in one instance the ligament between the two rows of carpals was torn. There was no fracture in these experiments.

Hyperflexion was tried twenty-five times (no previous dissection), with the following results:

Ten times: rupture dorsal carpometacarpal ligament.

Seven times: partial separation of dorsal capsule of radiocarpal joint and the ligamentum rhomboideum.

Six times: rupture of ligament between the two rows of bones.

Twice: partial dislocation of the head of os magnum.

Hönigschmied, as well as Nélaton, Bonnet, and Lecomte, was unable, by forcible hyperflexion, practised on the cadaver, to produce a fracture of the radius.

Albertin made a number of unsuccessful experiments in an effort to produce dislocations of the carpal bones.

Sheldon was equally unsuccessful in twelve experiments. In the normal movement of flexion and extension, there is more motion at the radiocarpal articulation than at the intercarpal. Braune and Fischer⁴⁹ have computed the ratio to be as 70:30. The practice of some trades (weavers) produces a loosening between the two rows of carpals. The dislocation of the head of os magnum is in fact looked upon by some as an incomplete intercarpal luxation. Complete intercarpal dislocation is very rare (Malgaigne, Maisonneuve).

The base of the os magnum is united by strong ligaments to the middle metacarpal bone. Its head articulates with a concavity formed by the scaphoid and semilunar bones, espe-

cially by the latter. If force be transmitted through the middle metacarpal and os magnum, the greater portion of it will be imparted to the semilunar. It has been said that the palmar ligaments of the semilunar are the weaker. Now, in cases of extreme hyperextension, where the palmar ligaments are torn, and force applied as above, the semilunar will be crowded out to the palmar surface of the wrist. In some cases the momentum has carried the bone an inch or two away.

Hyperflexion displaces the bones to the back of the wrist, especially the scaphoid and os magnum, and rarely, if ever, the semilunar. It is evident, then, that the violence which produces these dislocations has been found clinically and experimentally to result in fracture of the radius in the majority of cases. It is only when the conditions as to the force and the relative position of the hand and forearm are favorable that a dislocation will result.

Twenty-five of the patients fell from a height varying from several feet to seventy-five feet, striking the ground on the outstretched hands. Of the others, some slipped and fell on the side-walk; twice the hand was caught in machinery; three were hurt by striking a blow with the flat hand or fist; in one instance stones and rafters fell on the outstretched hand, the elbow happening to be fixed against a wall; in another instance the force was applied in exactly the opposite direction, viz., the extended hand resting against an immovable object, a piston-rod struck the elbow. Direct blows on the wrist have never been assigned as a cause.

Diagnosis.—In a large proportion of the simple cases reported, the condition had been diagnosed "fracture of the radius," and the patients were not seen by the reporter of the case for some time after the accident, having been treated by another colleague (Chisholm, Berger, Stoffel, Eigenbrodt, and Smith). The patients applied for the relief of continued pain, or on account of deformity and impaired function, which resisted all the usual measures employed in fracture (passive motion, massage, etc.).

Where there is a history of a fall upon the hands, espe-

cially if violent, and there is evidence pointing to involvement of the wrist, the possibility of a carpal dislocation should not be forgotten. While it is true that a fracture of the radius is the most common result of such an accident (excepting a sprain), I am sure that the dislocations in question will be more frequently discovered if looked for, and that some old fractures, with persistent deformity, hand "en griffe," pain and atrophy of the hand muscles, will be correctly diagnosed and treated.

The presence of a bony projection on the palmar surface of the wrist, or slightly above or below the same, without any palpable evidence of fracture of either the radius or ulna, and associated with considerable impairment of active and passive motion at the wrist, atrophy of the small muscles, or sensory and motor symptoms pointing to either the median or ulnar nerve, any and all are points in diagnosis. Again, the projection of bone may be on the dorsal surface of the joint; it may be movable and reducible, or more or less immovable and irreducible. There is no nerve involvement in the dorsal form, and the bone is rather more accessible to palpation.

The palmar dislocations especially may be mistaken for a fragment of the radius, so that only the employment of the Röntgen rays will lead to an absolute diagnosis. This aid to diagnosis will surely bring many obscure cases to light. An anteroposterior and a lateral view of the joint should be taken, and compared carefully with the same taken of the normal side, and with an articulated skeleton for reference. Either the bone will be found absent from its usual location, and its shadow seen elsewhere, or on lateral view the same will be seen projecting from the level of its fellows.

In Chisholm's case of anterior luxation of the semilunar, a needle was passed into the dorsum of the wrist, over the normal location of the bone, and absence of the latter thus discovered.

In compound fractures, with the loose bone either plainly visible in the wound or readily accessible to digital exploration, errors are scarcely possible; but the reports show that even under those circumstances the displaced carpal was taken for a fragment of the radius or ulna (Berger).

Treatment.—The treatment of dislodged carpal bones depends, first, on whether the condition is simple or compound; second, if partial or complete; finally, whether the bone is close to its former seat or has been displaced some distance away.

Compound dislocations are treated according to the general principles involving compound fractures. If possible, the bone may be by digital manipulation replaced in its normal position. If the bone be completely or almost detached of its ligamentous attachments, it may be better surgery to remove the same, especially if, as is usual, the wound be dirty, and reposition of the bone difficult. Judging from the cases reported, the function of such a wrist would be rather better without the bone than after replacing it under the conditions described.

In simple luxations, where the bone or bones are only partially dislodged from their relative position, it may require only a little manipulation of the wrist, accompanied by pressure on the projecting bones, to cause them to slip back into place. This is illustrated typically by the os magnum, which is almost always only partially dislocated; to a lesser degree by the trapezium, trapezoid, and scaphoid. As these luxations are liable to recur, an immobilizing dressing must be applied for a time sufficient for the ligaments to be regenerated.

Some of the simple partial luxations could not be completely reduced (Sheldon and Gay), but in spite of this the patients recovered good function.

In simple complete luxations (Buchanan, Taaffe, Smith, Morris, Stewart, Uhde, Mosengeil), where the bone has been forced out of the carpus, but has not been rotated on any of its axes, but lies just outside of its former place, it may be in the same manner reduced by manipulation. If, however, the bone has suffered rotation, more or less completely, as is often the case, then attempts at reduction will probably fail; for, without the aid of sight, the bone cannot be fitted among its fellows without the apposition of the wrong facets, and the interposition of shreds of capsule. If apparent reduction is accomplished by the use of great force, the function may not

be as good as that which follows non-interference or surgical removal. The smooth function of the wrist is based on the mutual harmonious adaptation of all of its bony elements. Should one of these be forced out and reduced with the wrong facets presenting, it may lead to a greater hinderance to motion than would be caused by its entire absence. Where two bones are absent, however, there is usually a marked disability.

Reduction cannot be considered at all where the bones are found some distance away, in an upward or downward direction. The cases are usually seen weeks after the accident, and, as is illustrated by my case, the bones are so embedded that it is idle to think of reposition. If they do not interfere with motion and the hand is useful and strong, then there is no indication to interfere.

Removal may be practised in cases where the bones seem to offer mechanical obstruction to free motion (Chisholm, Folet, Dubar, and Eigenbrodt). Furthermore, if there is nerve pressure, excision will bring relief (Berger's two cases, Gamgee, Cameron).

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THE TREATMENT OF INFANTILE SPASTIC PARALYSIS.¹

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I VENTURE to bring before you a subject which for many years has interested me, and which until quite recently has, so far as treatment is concerned, suffered unmerited neglect. There is something so uninviting and hopeless-looking about a case of cerebral diplegia, that a man must possess, in addition to a theory of attack, no small fund of enthusiasm before he decides on treatment. Cases of infantile hemiplegia, with half their brain and half their extremities in working condition, offer less obstacles to management, if less scope for ingenuity.

It is impossible to enter fully into the subject of cerebral paralysis, but I can indicate certain clinical types which offer adequate reward to surgical endeavor, and point out the remedial methods which in my experience have proved of value.

For the purposes of this paper, I would group cases into those of (1) Infantile Hemiplegia; (2) Cerebral Diplegia, and (3) Spastic Paraplegia.

Of 839 cases I have been able to collect from various sources, 510 were hemiplegic, 30 monoplegic, 142 paraplegic, 157 diplegic. This vast disproportion between the hemiplegic and the other groups is not borne out by my own experience, which favors the preponderance of the diplegic type.

Most generally the hemiplegia is an acquired, not a congenital, affection. It usually appears before the fourth year. The onset is very often heralded by convulsions, and in quite

¹ Being a paper read before the Liverpool Medical Institution, March 7, 1902.

a number of cases there are acute febrile symptoms which are in interesting contrast to the onset of adult hemiplegia.

From the first, the reflexes are exaggerated and the arm and limb are powerless. Deformities soon follow. The foot is arched and adducted; the knee is bent; the hip is internally rotated, somewhat adducted, and the femur is bent on the trunk. The arm is huddled to the body; the elbow is flexed to a right angle; the wrist is dropped; the hand pronated, and deviates towards the ulnar side, and the fingers generally grasp the thumb, which lies very forcibly adducted. As in the case of adults, rigidity of the affected muscles comes on in the generality of cases. This rigidity becomes more marked if the limb be moved either passively or by the child, and disappears under an anæsthetic. The aphasia so often present is motor in character and may accompany either left or right hemiplegia. Then follows an inequality of growth. This is more marked in the arm than in the leg; a fact probably accounted for by the difference in nutrition due to the more frequent exercise of the leg. I have seen the affected arm three inches or more shortened; it is rare to find the leg over an inch shorter than its fellow.

Of chief interest to us from the point of view of treatment are the following facts:

(a) The upper limb is more severely affected than the lower;

(b) The lesion of the upper limb is more permanent;

(c) The power of dorsi flexion of the hand with simultaneous extension of the fingers is lost;

(d) That movements are performed without precision, spasmodically, and slowly;

(e) That the power of adduction of the thumb is often lost.

The disabilities of the lower limb are generally:

(a) Contraction of the knee;

(b) Extension of the foot;

(c) Internal rotation of the femur with adduction;

(d) General rigidity.

The cerebral diplegic group is by far the most serious, as

we have here to deal with both arms and feet. Unless the hands can be used, the surgeon is sorely handicapped in any effort he may make to improve the condition of the limb. Clinically, we may divide this group into

(a) Cases with and cases without severe mental complication;

(b) Complete and partial disability of hands;

(c) Complete or partial disability of limbs;

(d) Cases complicated by athetotic movements.

In a number of cases the spasm is confined to the limbs, and this is the group to which we give the name of Little's disease or spastic paraplegia. Of the vast majority of cases even in this last group, a varying degree of mental derangement will be noted, and in many athetotic movements are present. A typical case of spastic paraplegia brought to the surgeon at the age, say, of twelve months is characteristic. Usually no contractions have occurred at the hip or knee; the child's legs are rigid; the toes are pointed; there is usually no internal rotation, and adduction is not sufficiently severe to cause a crossing of the limbs. The reflexes are exaggerated; the patellar reflex not usually causing a knee-jerk, but a leg-jerk. If the little patient be held by its arms, there is no endeavor made to separate the limbs, and should the toes be brought to the ground, and an effort made by the child to walk, both limbs move synchronously and in parallel lines. When passive separation of the limb is made, although it is easily effected, one can see and feel the antagonistic efforts of the powerful adductors. If at a later stage the patient is able to walk, several changes will be noted. The adduction will be more marked; the scissors walk will have developed, and a characteristic dragging of one knee around the other will be noted, which becomes more pronounced when any attempt at running is made. The body pressure is mainly transmitted to the ball of the toe. These contractures, however, at this stage, are generally spasmodic, and there is no appreciable shortening in muscle length. This shortening occurs at a still later stage, and is known as contracture.

In quite a number of cases the patients are in a hopeless position as far as walking is concerned. Any effort they make to move only serves to throw the muscles into violent contractions and the legs into extreme adduction. The most severe type of contractions in the legs may be associated with but very slight mental defects and unaccompanied by diplegia.

Before discussing treatment, I will briefly touch upon the pathology of spasmodic paralysis, if only to suggest how futile are operative procedures directed to the primary lesion. The pathological conditions in hemiplegia, paraplegia, and diplegia are the same in kind. The symptoms are due to the retardation of growth resulting generally from embolism or thrombosis together with changes in the spinal cord. In later cases one finds wasting and sclerosis of the motor tracts, with often a loss of substance in the form of cavities or cysts known as porencephalus. These cysts occur on the surface of the brain, and sometimes dip fairly deeply into it. They seem to be a late result in a growing brain, and to have produced an extensive scar substitute for cerebral tissue. Should the porencephalus or sclerosis be unilateral, hemiplegia results. If the scar is bilateral, diplegia or spastic paralysis ensues. The lesions, therefore, are a late product of a hæmorrhage, an embolism, or a localized encephalitis. In the cord, degenerations of the pyramidal tract or the lateral columns are to be found. Sachs and Peterson have analyzed seventy-three autopsies and found the following conditions: Atrophy sclerosis and cysts, 40; hæmorrhage, 20; embolism, 7; thrombosis, 5; tubercle, 1; total, 73.

Osler, in an examination of ninety brains, found a vascular lesion in sixteen,—seven due to hæmorrhage, nine to embolism.

The treatment of spastic paralysis has been too long in the hands of the physician for much real progress to have been made. Indeed, from medicine in this affection we have nothing to expect, apart from very indirect results, and we have only to scan the text-books on neurology to realize the note of pessimism which is sounded. Even Sir William Gowers, in his

"Diseases of the Nervous System," says, "The tendo Achillis is sometimes divided for contraction of the calf muscles in infantile spastic paralysis, but the operation is useless, and ought never to be performed." The same opinion has been pronounced by other distinguished men, so one can see how surgery has been silenced in the matter. I would argue that a large proportion of children suffering from severe spastic paralysis may be transformed into useful members of the community, improved both in body and mind by surgical methods, enabled to walk with comparatively little deformity, many requiring only the aid to be derived from one or two sticks.

The class of cases which we can place outside remedial art is the idiot, the microcephalic, and the violent, irritable type of diplegic, so often seen, subject to fits and active athetotic movements, who has generally lost all control over his secretions. The treatment of any condition short of this may be undertaken with varying success, subject to conditions which obtain in any surgical case requiring prolonged attention. For instance, active treatment may be needed for nearly two years. It would therefore be unwise to admit a case into hospital for two months, and then send it to a miserable home where neglect would be the inevitable sequence. Such a case, however, after hospital treatment, secure in the care of anxious, intelligent parents, no matter how poor, would prove a credit to all concerned. These are important matters which the surgeon must consider before he undertakes his work. Another class which gives the greatest anxiety and trouble is that where the affection of the hands is of such a kind as to promise but slight hope of their assistance to the limbs during walking. Before despairing, however, I think it is well to give such hands the opportunity of a careful trial, both as a mental discipline and because success sometimes exceeds expectation.

I would divide the treatment of all cases of spastic paralysis into operative and postoperative, for, although mechanism is involved in nearly every case, there is hardly a case which we are called upon to treat without invoking operative aid.

Infantile hemiplegia usually affects the arm much more

than it does the leg. This is almost invariably the case, and in this particular it differs from diplegia, where, when the four limbs are attacked, the hands are frequently less severely affected than the limbs. Indeed, in hemiplegia the paralysis of the hand is sometimes absolute, and in addition we have a complication in the shape of rigidity. The behavior of the lower limb differs also from that of spastic paraplegia in that the adductor spasm is proportionately not so marked.

The treatment of the hand and arm in infantile hemiplegia is distinctly less promising than in the diplegic case; but there are clinical signs to which I would draw your attention which help us to prognose success or failure. If the paralysis is complete, or, in other words, if the little patient is never known to relax his spasm, treatment is futile. If he only moves the fingers of his affected hand in conjunction with the fingers of the opposite side, the results will in all probability be discouraging. In all cases where the parents are able to say in the spirit of true observers that the patient is able to do more with the hand now than a little while ago, the success of treatment is assured. Similarly, where any degree of voluntary relaxation of spasm exists apart from an associated movement on the opposite side, treatment is emphatically indicated.

Noting that the dominant deformity in both hand and elbow is pronation and carpal flexion, treatment should consist in fixing the elbow supine and in hyperextending the wrist. The hyperextension of the wrist should be combined with that of the fingers, and a special arrangement adapted to keep the thumb at right angles to the palm. The spasm in these cases is often so pronounced that the extension of the wrist and fingers must be brought about very gradually. If the elbow is accompanied by contracture of the biceps and brachialis anticus, supination may be combined with extension. If this be not the case, the flexed position of the elbow will suffice. If, instead of being firmly pronated, the elbow lies semiproned, it is not necessary to treat it, and all one's energies should be directed to the hand.

It is difficult to give a reason as to how improvement

comes about, but it may be taken as an axiom that prolonged fixation of spastic muscles in a position opposed to their contraction lessens the severity of the spasm. This is true wherever spasm may be found, and its influence may be tested even in spasmodic torticollis, intractable as we know that affection to be. It would appear as if the group of muscles at last got tired of trying to pull. If the case be mild, this treatment may be discarded in about twelve months, if during the whole of that period the extension has been kept up without intermission. The test for relaxation must be the power of voluntary movement, however slow it may be. It will be noted that generally at this stage the patient, in endeavoring to extend his wrist, will first of all close his fingers, and will only open them on completion of extension. The process is reversed when the wrist is flexed. In order to meet this difficulty, the splint employed to extend both wrist and fingers is modified so as to extend the wrist alone and allow freedom to the fingers. At this stage or earlier, the surgeon may decide whether in a given case success may be predicted, and, if he is in doubt, operation should unhesitatingly be performed. Operation will consist of tenotomy or tendon transplantation; myotomy need only be mentioned to be avoided. An incision is made over the tendon of the flexor carpi ulnaris just above the annular ligament, another is made over the flexor carpi radialis, and both tendons are divided low down and taken: (*a*) the flexor ulnaris to be inserted into the extensor ulnaris, and (*b*) the radial flexor into the radial extensor. I performed this operation some years ago upon two spastic children, whom I showed before the Society for the Study of Diseases in Children, and in both instances voluntary movements were steadily performed, and one, a girl of nine, was able to write quite a respectable hand. At the present time one of the worst cases of athetosis in connection with cerebral diplegia is an inmate of the Liverpool County Hospital for Chronic Diseases of Children. When he entered the hospital, nearly two years ago, both limbs were firmly adducted, contracture had occurred, which had so affected the feet that plantar flexion had taken place with

almost evulsion of each astragalus and cuboid, the skin of each dorsum being reddened by pressure from within. The hands were firmly flexed and but little voluntary movement existed. Athetotic movements, more resembling chorea with occasional jerks which almost lifted the patient from his bed, complicated treatment. So far as the hands were concerned, hyperextension such as I have described was practised, and, later, division of the flexors of the wrist. The little patient has steadily progressed. He can voluntarily move his limbs in all directions; with aid he can take a few strides. In order to overcome severe spasmodic pronation of the forearm, Mr. Tubby has changed the point of insertion from the front to the back of the radius, of the pronator radii teres, thus transforming the muscle into a supinator. So far this operation has been performed seven times by him, and I intend practising it on a series of cases during the summer.

Tenotomy alone has proved distinctly disappointing, although one has had an occasional successful case. The operation should be confined to the division of the flexor carpi radialis and ulnaris. It is, in my opinion, better to elongate the other flexors of the hand by a long median incision, such as one would employ in lengthening the tendo Achillis. Tendon transplantation, however, is a better operation, less complicated, and more reliable. The surgeon's art, however, does not end with the operation, and hyperextension of the wrist, leaving the fingers free, should be practised for a further few weeks. In order to prevent adhesions after the operation, the wrist should be freely, but withal very gently, moved in about a fortnight's time. Whether an operation has been performed or not, the final stages of treatment are identical. They should consist in getting both guardian and patient to strive every nerve to urge and practise movements from simple to complex. The surgeon must inspire confidence and instil enthusiasm. Failure depends upon men as well as measures, and a thoughtless, impatient word of discouragement may paralyze all effort.

The nature of the movements to be practised must be left

to the ingenuity of the surgeon. The principle which should govern him may, however, be indicated here :

(a) The movements should be practised slowly and without excitement ;

(b) They should be made interesting to the child ;

(c) Those opposed to the direction of deformity should predominate ;

(d) Those presenting the greatest difficulty should be chiefly practised.

Just a word before we deal with paraplegia regarding tenotomy of the spastic muscle. Empiricism has taught us that for some reason or another tenotomy lessens both in frequency and intensity the spasmodic element in paraplegia. I do not merely mean to say that division of the tendo Achillis controls spasm in the calf muscles,—although, of course, it does,—but rather that spasm in which those muscles are not directly concerned is also influenced. This is beyond all question, and must have been noted by everybody who has had the opportunity of observing, and the fact has now reached the robust stage when physiological explanations are vouchsafed.

Whitman urges that by elongation of the tendon the response to the exaggerated motor impulses is lessened, and an opportunity for more effective control is afforded.

Mr. Tubby has propounded the theory that once the immediate pathological effect of the central nervous lesion has subsided, the spinal cord remains in a state of undue reflex excitability. A tightly contracted muscle and tendon tend to augment this condition, and so induce in themselves further contractions. In other words, there is a vicious circle of reflex action which can be interrupted by section of the tendon, and diminution in the tension of the affected muscle and tendon.

Lorenz attributes the good effect to the shortening of the bellies of the tenotomized muscles, so that their range of action is diminished. Both these theories refer, of course, to spasm with which the divided muscle is concerned, and do not explain the diminution in spasm experienced elsewhere. We must further remember that the opponents of contracted muscles are

always elongated and weak, and that the rest afforded them by tenotomies, by relieving them of strain, helps to restore muscular equilibrium.

The practical deduction from these observations is that no opportunity should be lost of performing a tenotomy. Even in mild cases, where a spastic tendon is to be felt, let us ruthlessly divide it.

If the surgeon has decided that a case of spastic paraplegia is suitable for treatment, a splint should be prepared, so designed as to keep the limbs in marked abduction. The area over the hamstrings, the adductors at the groin, and the tendo Achillis, should be suitably prepared for operation. The adductors should be first attacked. An incision an inch and a half long should be made to the inside of the adductor longus. This muscle should be seized by a Spencer Wells or a small Doyen forceps, and about three-quarters of an inch of it removed. The limb is then abducted, and portions of the adductor brevis and gracilis are exsected in similar fashion. The horizontal portion of the adductor magnus and, if necessary, the pectineus is divided, and also any tissues, muscular or fibrous, obstructive to an absolutely free abduction of the femur. Experience has shown me that, although the chief offenders are the adductors longus and brevis, nevertheless the deeper muscles often require division. To any one who has practised the operation, the futility of attempts to effectively divide the muscles subcutaneously will be apparent. Division is followed with but little hæmorrhage, and the wounds are closed without drainage. Having exsected the pieces of the adductors, each tendo Achillis is divided subcutaneously and rectangular splints are applied to the foot. The limbs are then well abducted, and the surgeon notes whether there is any obstacle to easy extension of the knees. If there should be (it is not often the case), an open incision must be made on each side of the popliteal space, and the tense hamstrings are in turn divided. If these incisions are long enough, the fascial contraction can be attacked on either side, for it is here that opposition is often found. I would discourage the

use of a transverse incision, as, when adopted, it often seriously hampers the surgeon's efforts to fully extend the knee by reason of the strain cast upon the sutures. In 1885, when I was at the Stanley Hospital, there used to be an adult diplegic in a perambulator always at the gates, and on two or three occasions I took him in to try and straighten his contracted limbs. On one occasion I removed about an inch from each of the hamstrings, but he was mentally so deranged that we did not do each other any credit. I mention the fact, however, because Lorenz, of Vienna, has quite recently written on the advantage of exsecting portions of the hamstrings.

We have now presumably got our patient comfortably stretched upon an abduction frame, and we must keep him there for three months. The wounds heal very rapidly, and suppuration has occurred in the adductor cavity on three occasions only, despite the insanitary position of the wounds and the number of operations performed; for instance, in 1890 I operated on twenty-seven patients, and this may be taken as a fair index of my yearly return.

At the end of three months the splint is taken off during the day and movements are sedulously practised. For some weeks stiffness exists, and often the movements are at first painful, but after a time, always shortened by vigorous exercise, the pain disappears, and the effort must be made to walk.

The splints are of a simple kind designed to keep the knee from bending. The boots should be made of felt with substantial soles. The nurse should be instructed to keep both boots and splints upon the patient day and night, and, for the first two weeks, frequently during the day, abduction, adduction, flexion, and extension of the hip should be practised. This should be done with and without resistance. At night-time the feet should be attached to the side of the bed in order to maintain abduction. After the first few days of this later stage of treatment, the splints should be removed twice a day and the muscles well massaged, and both active and passive movements of ankles, toes, knees, and hips encouraged. Any movement executed in a jerky style should be practised until perfected.

The little patient may now try to walk. It will be noted that one of the difficulties of an untreated spastic when he tries to walk is the narrowing of the pedestal upon which the trunk rests by reason of the adducted limbs. Operation has now overcome this, and with abducted limbs the body is poised upon a widened pedestal. During early training, the nurse must see that, while walking, the limbs are not approximate, and that, from the first, swinging of the limbs must be prohibited. Crutches should not be allowed until the patient has been taught to stand unsupported. I need not enter into any more detail regarding this most important stage of treatment, but would add that it affords an inexhaustible field for ingenuity, and that upon the intelligence and industry of the nurse very much depends.

Diplegic hands are treated on the same principles as I have enunciated in regard to infantile hemiplegia, and they must be trained to hold sticks and crutches with a firm, unyielding grip. I cannot now deal with individual cases, but I may say I have operated on cases from twelve months to twenty years of age. A large number of these were so bad that they had never attempted to place one foot before the other. Some were structurally flexed (contractured) at ankle, knee, and hip. A most helpless youth of twenty, one limb across the other, was able in six months to stand erect and walk with two sticks, and twelve months later could move his limbs north, south, east, and west, with hardly an appreciable jerk. Success in an ancient case, where so much has to be unlearned, and where the mechanical stage offers such difficulty, proves the accuracy and efficacy of the principles I have endeavored to expound. It is logical to infer that, if old neglected cases are amenable to surgical education, our prognosis should be very hopeful in the young.

With regard to the degree of benefit to be derived from treatment, the parents should be given to understand that under favorable conditions of nursing and tuition the child, aided by the hand or sticks, will be able to walk varying distances in from twelve months to two years, and that with perfectly

straight limbs and heels on terra firma. A large proportion of cases will later on manage aided by one stick. Even in the least successful cases, parents, mostly having despaired, are full of gratitude. The mental condition of the children obviously improves when their physical defects are remedied and they are enabled to mix with their little friends. Complete recovery in spastic paraplegia is, of course, impossible.

It will be gathered from my remarks that I wish to urge that the treatment of spastic paralysis should resolve itself into a system. Such a system involves operative, mechanical, and educational stages. The treatment cannot be separated into parts. If the surgeon is not satisfied that the case is to be under his control for twelve months, he will consult his reputation best by leaving it alone. Operations not followed up by careful and prolonged after care give rise to disappointment and discredit. Merely dividing tendons to be followed by massage and electricity is futile and dispiriting.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, November 26, 1902.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

CONGENITAL DISLOCATION OF THE HIP.

DR. ROYAL WHITMAN presented a child, two and one-half years old, with a congenital dislocation of the left hip, which was reduced by Dr. Whitman ten months ago by the bloodless method. After the reduction, a plaster bandage was applied and kept on until two months ago, when an ordinary cotton bandage was substituted, which had been removed to-day. The two limbs are now absolutely equal in length, and the head of the femur can be felt in its normal position in the centre of Poupart's ligament. The child does not limp, but has a characteristic rolling walk, which is an indication of the evening up of the gait.

Dr. Whitman said he regarded one and one-half to three years as the most favorable age for operation in these cases. At such an early age there is practically no after-treatment necessary, and the speaker said a relapse had never followed in a case presenting the indications of success illustrated in the patient presented. In fact, the patient was shown for the purpose of demonstrating these indications.

Under favorable conditions, Dr. Whitman said he thought he might be able to effect an absolute cure by this method in more than 50 per cent. of the cases of congenital dislocation of the hip. One very common obstacle to the successful application of this method is an anterior twist of the neck of the bone. In such cases the dislocation can be reduced, but the head will not stay in its normal position until the deformity is remedied by an osteotomy.

In response to a question, Dr. Whitman said that in the case he had shown there was an actual reduction of the bone, not a

transposition. The latter procedure is always accompanied by slight shortening and a limp. Transpositions are often called successes when they are not such at all.

DOUBLE HALLEX VALGUS.

DR. ROBERT H. M. DAWBARN presented a woman upon whom operation was done two years ago. The result has been ideal. After applying a tourniquet at the thigh, a semicircular incision, with its convexity outward, was made, and the flap turned in. The joint was then opened, and with the Gigli wire saw the head of the first metatarsal bone removed, and the flap stitched with interrupted catgut sutures. Next the toe was put into the straight position and a short splint made of a strip of cigar-box, boiled and padded with gauze, applied to the sole and this toe, being careful to maintain a gap, where the head was, to be filled by blood. Gauze dressings cover the foot, then gutta-percha tissue, and finally a plaster-of-Paris splint encases all, carried up to the knee. Only then is the tourniquet removed. The splint is left on for about four weeks, and the patient then has a painless, freely movable false joint. Healing has taken place by the Schede moist blood-clot method, the clot organizing into connective tissue with great speed.

The deformity in these cases of hallex valgus consists always in the subluxations of the first metatarsal bone and first phalanx, and practically never is there any bony hypertrophy. As to the accompanying bursitis, this is ignored and will disappear unless already suppurative; in which case the operation needs two stages. In the first the bursa is cleanly excised. After sound healing, the operation above described is performed. Dr. Dawbarn said he had done this operation in at least fifty cases, and every one had been successful; but any break in asepsis would obviously be disastrous. The operation does not necessitate the cutting of any tendons nor interference with the sesamoid bones, nor with the base of the first phalanx. The toe is shortened from one to one and one-half centimetres. The only point of originality claimed is the shape of the flap. This gives abundant room, as needed, but is so placed as not to be pressed upon by the shoe later on. The scar is semicircular, or in bad cases even horse-shoe in shape,—toe outward.

The slight shortening of the toe is of no importance, and, instead of being a deformity, it is quite the contrary, as the foot then more closely conforms to the type handed down by the Greek sculptors.

In conclusion, Dr. Dawbarn said he hoped the members of the Society would continue to use his suggestion, the term "*Hallux valgus*" instead of "*hallux valgus*:" the latter term is the one universally used in the text-books, but there is absolutely no good Latin authority for it. There is no such word in the Latin language as "*hallux*."

DR. WHITMAN thought perhaps Dr. Dawbarn was rather too enthusiastic in regard to the improvement in the appearance of the foot after the operation he had described. The result obtained in the case shown was extremely good, but he was inclined to believe that after some of these operations there would be even a greater shortening of the toe than in this instance.

CONGENITAL TALIPES EQUINOVARUS.

DR. HOTCHKISS presented an Italian, aged thirty-four years, who was operated upon, March 6, 1902, for congenital talipes of the right foot. The case was of especial interest on account of the age of the patient, the extent of the original deformity, which was extreme, as shown in the plaster cast exhibited, and on account of the excellent result, functional and cosmetic, which had been obtained.

The operation had consisted in the removal of the astragalus, the scaphoid, a portion of the anterior end of the *os calcis*, and the posterior end of the cuboid, flush with the articular surface of the external cuneiform. This had been accomplished through the incision recommended by Lauenstein for the removal of the astragalus, *i.e.*, an incision beginning at a point well up on the shaft of the fibula and extending down to and over the external malleolus, thence forward along the outer border of the foot and curving forward upon its dorsum. Through this cut the external lateral ligaments of the ankle are divided, the astragalus dislocated outward and easily removed, and the other bones were easily dealt with. The *tendo Achillis*, which was very small, was divided, but retracted only slightly. After the removal of the bones the foot easily fell into approximately normal position, but the

contraction of the soft tissues of the inner arch seemed still to hinder a perfect reposition, and they were divided by the open incision of Phelps. The foot was held in a somewhat over-corrected position after suture of the external wound and covered with a large dressing, over which a plaster case was applied.

The Phelps incision had healed aseptically under the blood-clot, but the external wound had discharged sloughs and had healed finally by granulation, most of the sutures being removed on account of tension due to the accumulation of fluids in the dead spaces. The final result as shown was most excellent. The patient now has a small, flat, but straight, and very useful foot. There is very slight motion at the new ankle-joint; the patient walks with scarcely a limp, wears an ordinary shoe, and is getting about better every day.

In connection with this case, Dr. Hotchkiss showed a plaster cast, which demonstrated the extent of the deformity previous to the operation. The speaker said that in these cases of extreme deformity, in adults, enough bone must be removed to allow the foot to be easily over-corrected. The removal of a wedge-shaped piece of the tarsus is not generally sufficient.

DR. WHITMAN said that while the result obtained by Dr. Hotchkiss was extremely good, he would suggest the advisability, in these extreme cases, of dividing the operation into two or three sittings rather than to attempt to correct its deformity at once. If one were content, at the first sitting, to give the foot a vigorous stretching, and at the second sitting to do a Phelps operation, splitting the foot wide open, it would eventually be found necessary to remove less of the bony structure.

EXTENSIVE DIFFUSE PERITONITIS CAUSED BY A GANGRENOUS APPENDIX; PERITONEUM CLOSED WITHOUT DRAINAGE.

DR. W. G. LE BOUTILLIER presented a lad, sixteen years old, who was operated on October 23, 1902. He was admitted to the hospital on the fourth day of an illness that had begun suddenly with cramp-like pains in his abdomen, soon succeeded by vomiting. The pains had not been localized, vomiting had been persistent, and there had been constipation and great prostration.

When admitted, he was apathetic and suffering from general abdominal pain. The abdomen was moderately distended and tender all over, but tenderness was greatest in the lower portion, and particularly on the right side. Here the muscles were extremely tense, although there was some muscular rigidity all over the abdomen. No tumor could be felt. The leucocyte count was 14,800. Pulse, 96; temperature, 101.6° F.

The operation was done two hours after admission. A small incision was made by McBurney's method over the usual site of the appendix. On opening the peritoneal cavity turbid serum escaped, and the intestines were found deeply congested and in places slightly adherent. The wound was enlarged sufficiently by cutting across the fibres of the internal oblique, and the appendix found near the median line, dropping over the pelvic brim. The appendix was gangrenous in distal half, perforated near the tip, and surrounded by a small abscess of stinking pus, shut in by firm adhesions. The pus was sponged away after isolating the rest of the abdominal cavity by gauze, the appendix removed, and stump invaginated in the usual way. The general abdominal cavity was explored completely, and the intestines were largely exposed by evisceration. The inflammation was most acute on the right side, where the coils of gut were almost purple in color, coated with fibrin and pus. Sponges on sticks passed to the neighborhood of the loin and spleen were withdrawn coated with fibrin and charged with a thin seropurulent fluid. Much of the loose fibrin was detached from the intestines by sponging, and large quantities of saline solution were used to flush the abdominal cavity. When this returned clear, the intestines were replaced and protected, and the patient gradually raised in Trendelenburg's position. The pelvis was filled with stinking pus, which escaped through the wound, and the pelvic walls were thoroughly sponged and irrigated. The intestines were acutely inflamed wherever seen. The wound was entirely closed in layers, leaving as much salt solution as possible in the peritoneal cavity, and draining only the subcutaneous tissues with folded rubber tissue.

Recovery from ether was prompt and satisfactory. During the night the patient vomited once, and had considerable abdominal distention, pain, and great thirst. Morphine was given in moderate quantities, and the rectal tube inserted to relieve the

distention. Salt solution eight ounces, with one-half ounce of whiskey, were given by rectum every two hours and absorbed.

During the next twenty-four hours vomiting occurred three times, but stopped after washing out the stomach. Hot water by mouth in small quantities was allowed. Pulse ranged from 108 to 90 and the temperature fell to 99.4° F. Two fecal movements resulted from enemata.

On the fifth day the temperature was rising, although the pulse was ranging from 72 to 90. The wound was reopened down to the peritoneum, as it had become infected by the pus which passed over it at the operation. The peritoneum, however, was not reopened. The subsequent progress of the case was uneventful; the patient was allowed to sit up out of bed on the thirteenth day, and to go home on November 16.

THE PRESENT STATUS OF THE TREATMENT OF MALIGNANT TUMORS WITH THE X-RAY.

A paper with the above title was read by DR. WILLIAM B. COLEY.

DR. DOWD said he had seen some of the cases to which Dr. Coley referred in his paper, and had witnessed the good results following the treatment. In some cases of his own in which the X-ray treatment had been tried, there had been a diminution in the pain, but the progress of the disease was not stopped.

Dr. Coley had called attention to the danger of the X-ray treatment in cases that should be treated by operation. Some X-ray therapists are so enthusiastic regarding the treatment, that they refuse to admit that any of these cases should be treated by operation; although, in fact, the curative effect of operation is much better established than that of the X-ray. Early cases of breast cancer, for instance, should not be deprived of the well established advantages of operation while the experimental use of the X-ray is being made.

DR. DAWBARN emphasized the point that in cases of malignant growth that are clearly operable it is dangerous to wait until the X-ray treatment has been given a trial. A number of cases in which this had been done with unfortunate results have come under his observation. One patient with cancer of the lower lip upon whom he recently operated for Dr. MacCracken,

of this city, had been previously subjected to the X-ray treatment without any benefit whatever, and during that time a lymphatic node below the jaw had become involved. The removal of this added to the severity of the operation, and the fact of its occurrence greatly increased the prospects of a recurrence of the disease. While the X-ray treatment is beneficial in many of these cases, it is very unwise to depend upon it in every instance, and thus delay operative interference. It would seem, in simple cases, safer to excise, and then use the X-ray to prevent recurrence.

DR. WILLY MEYER said that while his experience with the X-ray treatment of malignant tumors was very limited as compared with that of Dr. Coley, still, he has seen some remarkable results follow its use, especially in epitheliomata. He thought the X-ray treatment was particularly indicated in cancer of the breast subsequent to removal of the tumor, because in those cases, in spite of a far-reaching excision, we know that cancerous tissue is very apt to be left behind. In all of these cases, the speaker said, X-ray applications should be given as an after-treatment.

DR. GEORGE D. STEWART reported the case of a man, sixty the root of the nose and both eyelids, apparently a carcinoma (although the diagnosis was not confirmed by a pathological examination), which disappeared entirely under the X-ray treatment, leaving scarcely a trace behind. If this case had been operated on, it would have necessitated an extensive dissection and a subsequent plastic operation, and would no doubt have left an ugly scar.

In conclusion, the speaker emphasized the fact that in spite of the surprising cures that are occasionally reported by the use of the X-rays, and no matter how rapid the strides that are made in this method of treatment, operable cancer surely belongs to the surgeon, and the after-treatment to the X-ray therapist.

DR. GEORGE D. STEWART reported the case of a man, sixty years old, who presented himself last January with a deep, ulcer-like epithelioma of the side of the neck. It was more than three inches in diameter, extending over the ramus of the jaw, the bone being apparently thickened and its periosteum extensively involved. A specimen of the growth was sent to Dr. Brooks, who pronounced it an epithelioma.

An operation was undertaken, not with the idea of com-

pletely eradicating the disease, but simply for the purpose of improving the condition. As much as possible of the growth was excised. It was found to involve the external carotid artery and the deep jugular vein, and, as the operation had already been somewhat prolonged, it was decided to stop and perhaps do a subsequent operation. Instead of this, he was subjected to the X-ray treatment for about a month. During this interval the cavity left by the operation, which was very deep and over three inches in diameter, gradually became filled with granulations. These were subsequently covered by skin-grafts, cut according to Thiersch's method, some of which took and others did not. At any rate, the patient felt so well that he soon left for his home.

When he presented himself again, a few days ago, he was apparently cured. The cavity had entirely filled, and was covered with fair integument which was slightly eczematous about the margin of the wound.

DR. W. B. COLEY asked that Dr. F. S. Mandlebaum, Pathologist to the Mt. Sinai Hospital, be permitted to show a microscopic specimen from the sarcoma of the femur which had been presented by Dr. Rogers at a meeting of the Society a month ago, and who was well more than four years after toxin treatment. In the history of the case which was given by Dr. Rogers at the time, some doubt had been raised as to the accuracy of the diagnosis of sarcoma on account of the subsequent development by the patient of a condition in the nose which had been regarded by one observer as specific.

The specimen shown by Dr. Coley was a typical giant-celled sarcoma, and had been so pronounced by Dr. T. Mitchell Prudden, Professor of Pathology at Columbia University.

DR. F. S. MANDLEBAUM, the pathologist of Mt. Sinai Hospital, who had made the microscopic examination in the case shown by Dr. Rogers, stated that when the patient was first admitted to the hospital, on May 24, 1898, she had a fracture of the neck of the femur, caused by slipping on the floor four days previously. The limb was kept in Buck's extension for nine weeks, and the patient left the hospital on July 24, before union had occurred. In November of the same year she fell, and felt a sudden snap in the region of the original fracture. This was followed by pain, and when the patient returned to the hospital,

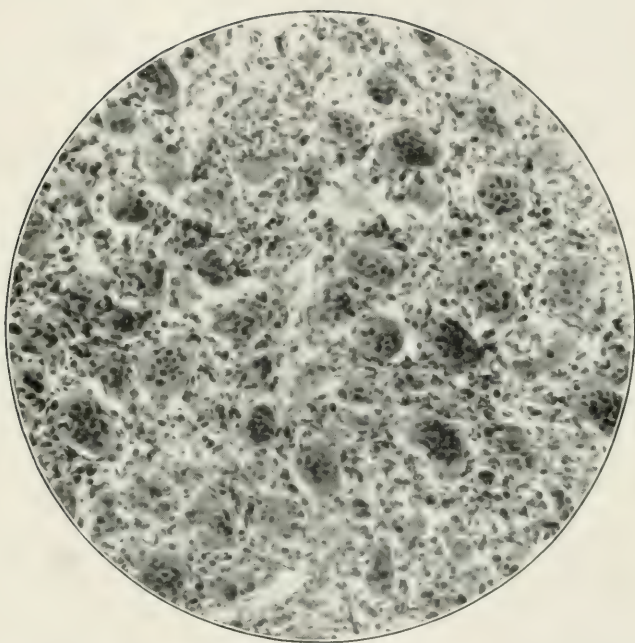
on December 20, she was apparently suffering from an ununited fracture of the neck of the femur. There were two and one-half centimetres shortening on the affected side, and false motion in all directions, but no crepitus. A tumor was made out over the outer aspect of the thigh. On January 5, 1899, Dr. Gerster incised this growth and removed a specimen for microscopic examination. It proved to be a giant-celled sarcoma. Suppuration followed, the patient developed considerable temperature, and broken-down masses of the tumor were discharged. From January 25 to February 19, 1899, the patient received daily from one to three minims of the erysipelas toxins, after the Coley method. In spite of this treatment, the tumor continued to grow, enlarging towards the femoral region. The retroperitoneal glands were much enlarged. From July 27 to August 8, 1899, injections of arsenic were made, and on August 14 she was transferred to the Montefiore Home.

In August, 1901, the patient was operated on by Dr. Rogers, who curetted a large bone cavity, and in February, 1902, by Dr. Elsberg, who cleaned out the cavity and filled it with iodoform paraffin. It was during the latter's service that the patient finally recovered, the sinus in the femur closing up, and all evidences of a malignant growth disappearing. A portion of the material removed by Dr. Elsberg was examined by Dr. Mandlebaum, and this showed only inflammatory fibrous and myxomatous tissue; the former evidences of giant-celled sarcoma had entirely disappeared.

In commenting on this case, Dr. Mandlebaum said that the pathologist is extremely cautious in making a diagnosis of round-celled sarcoma, as a number of instances are on record where sarcoma has been mistaken for syphilis, and *vice versa*. In the case under discussion, however, the diagnosis of giant-celled sarcoma was very clear, and there was no suspicion of syphilis.

As far as the recovery of this patient is concerned, we all know that this occasionally happens in sarcoma. Such a recovery has frequently followed the occurrence of some infectious process, and we know that giant-celled sarcoma is less malignant than other types of the disease.

Slides and photomicrographs of the tumor were then exhibited. (See figure.)



Photomicrograph of section of sarcoma of thigh operated upon by Dr. Rogers.

Stated Meeting, December 10, 1902.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

GUNSHOT WOUND OF THE ABDOMINAL CAVITY, LIVER,
AND RIGHT PLEURAL CAVITY.

DR. JOSEPH A. BLAKE presented a man, thirty years old, who was admitted to the Roosevelt Hospital, October 13, 1902, at 7 P.M., who just previous to his admission had been shot in the abdomen. He had always been well and strong and had indulged moderately in alcoholic stimulants. At the time of his admission there was a considerable degree of shock, extreme pallor of the face and lips, air hunger, and the respirations were rapid and shallow. The pulse was feeble and thready in character, but not increased in frequency: the temperature was 99.8° F.; respirations, 28.

Examination showed a bullet wound in the left hypochondrium, passing inward and backward through the outer border of the left rectus abdominis muscle, through which a probe could be introduced about four or five inches inside the abdominal cavity. The bullet was found embedded underneath the skin between the seventh and eighth ribs at the anterior axillary line of the right chest, and had evidently passed obliquely through the body. Examination of the right chest showed dulness below the angle of the scapula, with loss of voice and breathing sounds and a few moist râles. Over the abdomen there were marked muscular rigidity and tenderness, and slight dulness on percussion in the region of the flanks, the level of which changed with the position of the patient.

After the patient's admission to the hospital, the evidences of internal bleeding became more pronounced, and an immediate operation was decided upon. This was done by the House Surgeon, Dr. A. C. Prentice. An incision, eight inches long, was made in the median line, from the ensiform cartilage to the umbilicus. Upon opening the peritoneum, a large quantity of free blood, fluid and clotted, presented. It was rapidly removed with the hands and gauze sponges. The bleeding was found to arise from a wound in the anterior surface of the left lobe of the liver,

and a second wound upon the superior surface of the right lobe, the latter considerably larger than the former, and extensively lacerated. The wound in the left lobe was packed with sterile gauze, which controlled the hæmorrhage. The wound in the right lobe could not be reached through the median line incision, and a second incision, three inches long, was thereupon made through the abdominal wall at the free border of the ribs in the right mammary line. Several strips of sterile gauze were packed between the right lobe of the liver and the diaphragm; the ends of these strips were brought out through the incision wounds, and the latter closed in layers, plain catgut being used for the muscular and aponeurotic structures and silkworm gut for the skin. The sutures were interrupted. Six days after the operation the cutaneous sutures were removed. Shortly afterwards, in a fit of coughing, the median wound gave way, and nearly all the small intestine escaped under the dressing.

The patient was immediately anæsthetized, the intestine washed and reduced, and the wound closed by deep sutures of chromicized gut and superficial ones of silkworm gut. There was some suppuration about some of these sutures, and they were removed, part of the wound healing by granulation.

INTRAPERITONEAL RUPTURE OF THE BLADDER.

DR. P. R. BOLTON presented a negro, forty-five years old, a stableman by occupation, who was admitted to the Hudson Street Hospital on November 9, 1902. On the day before his admission to the hospital (after two days' intoxication), he awoke with a pain in the lower abdomen. This was aggravated on movement, and gradually became more severe, soon extending over the entire abdomen. When the patient came to the hospital he complained of the severity of this pain; he stated that his bowels had not moved for two days, and no urine had been passed in twenty-four hours.

A physical examination showed that the heart and lungs were normal. The abdomen was somewhat distended; it was markedly tender over the whole area and tympanitic upon percussion, excepting over the bladder, which was somewhat flat. Upon the introduction of a catheter into the bladder, ten ounces of clear urine were withdrawn. The bladder was irrigated with

salt solution, and the same quantity that was injected returned clear. Unsuccessful efforts were made to move the bowels by enemata.

As the abdominal distention and pain gradually grew worse, Dr. Bolton made an incision, four inches long, above the pubes, through which half a gallon of pale, amber-colored fluid escaped from the abdominal cavity. The intestines were somewhat inflamed, and on the posterior surface of the bladder a rupture, half an inch long, was found, the edges of which were covered with a fibrinous exudate. The rupture was closed with a double row of silk sutures. A cigarette drain was introduced through the abdominal incision and a tube inserted into the bladder through a small perineal opening. The abdominal wound was dressed every two days, and the cigarette drain was taken out at the end of a week. The perineal tube was removed on the twelfth day. After the tube was removed on the twelfth day, the patient was instructed to micturate about every three hours. There was no leakage. The urine at first contained a trace of albumen and some hyaline casts, but the latter subsequently disappeared.

The patient made practically an uneventful recovery, and was discharged cured on the 6th of December, 1902, after spending twenty-six days in the hospital.

DR. HOWARD LILIENTHAL thought that, in the absence of any history of injury and instrumentation, it seemed more probable that this was a case of perforation resulting from some pathological condition of the bladder-wall.

DR. BOLTON, in reply to Dr. Lilienthal, said he had examined the interior of the bladder carefully with the finger, and could find no evidence of ulceration or other pathological condition of the bladder-wall.

UNUNITED FRACTURE OF THE LOWER EXTREMITY.

DR. JOHN ROGERS presented a girl of thirteen, who, as the result of a fall nine years ago, sustained a fracture of the lower end of the tibia and fibula of the right leg. She was taken to Bellevue Hospital and treated by two competent surgeons by means of the plaster splint, but union failed to occur. The fragments were then wired and the splint reapplied and kept on for

two years, but without success. About five years after the latter operation had been done, sections of the silver wire were extruded through the skin during an interval of several months. Subsequently, a splint was again applied and she wore a shoe-brace, but union did not take place.

When Dr. Rogers first saw the patient last May, there was a very evident fracture of the lower third of the tibia, with a motility almost equal to that of the ankle-joint. Upon opening up the parts, it was seen that the lower end of the upper fragment was a concave piece of bone, without any synovial membrane; the lower fragment was quite pointed, and united to the upper by a thin strand of cartilage. This cartilage was excised, the bony ends freshened, the two fragments sutured with chromicized catgut, and a plaster case applied. The operation was done almost three months ago; it was apparently not followed by the formation of callus, and only slight union has occurred. There were of treatment, good bony union seemed impossible or indefinitely and this of course still persists.

Dr. Rogers said he could not account for the lack of union in this case. There was no specific history or other constitutional disease, and no indication of rickets. The case was presented as one of that fortunately rare kind in which, in spite of the best of treatment, good bony union seemed impossible or indefinitely delayed.

DR. F. KAMMERER said that, while he had not seen any of these cases in recent years, he thought it was not very unusual that a bone should refuse to unite, even after repeated operative interference. He did not know that a satisfactory explanation of this occasional occurrence has yet been given.

SARCOMA OF RIB APPARENTLY CURED BY OPERATION AND COLEY'S FLUID.

DR. LILIENTHAL presented a man, forty-eight years old, whose previous history was negative, who was under the observation of Dr. Alfred Meyer, of this city, for a number of months for an apparent enlargement of the seventh rib on the left side, in the region of the axillary line. The trouble had existed about nine months, and had commenced with pain and a crackling sound upon palpation over the affected rib. The external mass

had only existed about five weeks. There were no pulmonary symptoms. Since the onset of his symptoms, the man had been failing in flesh and strength. For several weeks he had been placed upon large doses of potassium iodide, but without resulting permanent benefit.

When the patient came under Dr. Lilienthal's observation there was a large, sausage-like mass over the seventh left rib, with distinct fluctuation at one point. A peculiar crepitant sound could also be elicited, which was characteristic of what was sometimes observed in sarcoma of the rib, and which he had also seen in tuberculosis of the rib.

November 15, 1901, an incision was made over the mass, and upon aspiration a syringeful of bloody serum was withdrawn. Upon dissection, it was found that not only the seventh but also the eighth rib was involved, together with the various tissues which covered them. An attempt was made to do a radical operation and extirpate the entire new growth, but this was found to be inadvisable on account of its extensiveness and the firm adhesions to the pleura. The main cyst, over the seventh and eighth ribs, was as large as a small hen's egg; it was lined with a smooth, glistening membrane, and filled with a sero-sanguinolent fluid. After evacuating this cyst, as well as a smaller one which was located far up in the axilla, a large section of the seventh rib and a part of the eighth were removed, together with a considerable section of the parietal pleura, which was so extensively involved that a total extirpation of the growth was out of the question. The wound was then closed, with drainage at its upper and lower angles, and the patient was sent to bed. He recovered well from the operation, but almost immediately a slight swelling was noticed at each end of the incision, and the man's general health continued to decline. It was then decided to use Coley's fluid, the preparation of Parke, Davis & Co. being selected. He was given five injections of half a minim, which were followed by reaction, and the dose was gradually increased to eight minims, which produced a severe reaction, so that the dosage had to be reduced. The treatment was continued for a period of about eight weeks, and from the very first an improvement in the man's condition was apparent. The signs of swelling gradually disappeared, and the patient's general health improved to an astonishing degree. His present weight was greater

than ever before in his life, and he considered himself perfectly well.

Specimens of the growth which had been submitted to Dr. F. S. Mandlebaum, Pathologist to Mt. Sinai Hospital, for microscopic examination had been pronounced pigmented sarcoma of the fibromyxomatous type. The principal point of interest in connection with the specimens was the infiltration of the sarcomatous tissue by the pigmented cells.

DR. WILLIAM B. COLEY said that his own experience with the mixed toxins in the pigmented type of sarcoma had not been very satisfactory. Among at least a dozen cases of this kind, he had seen only temporary improvement, and he could recall only one—a melanotic sarcoma of the upper jaw, treated by Dr. George R. Fowler—in which the growth had disappeared entirely, but there was a recurrence after two years.

PYLORECTOMY, WITH WIDE GASTRIC RESECTION.

DR. LILIENTHAL presented a Swedish woman, twenty-nine years old, whose present illness began five and one-half months ago with vomiting after meals, at first three times a day, but more recently only once a day, in the afternoon. The vomitus was acid, chocolate colored, and usually not less than a quart at a time. She also complained of heartburn, which was always relieved by the vomiting. Her appetite was excessive. Her bowels were regular; the urine was normal. In spite of the fact that she had lost thirty pounds in weight since last May, her general condition was fairly good, and she had been able to work uninterruptedly.

Upon her admission to the hospital, October 16, 1902, the patient was found to be markedly anæmic; there was considerable enlargement of the inguinal glands, other glands being normal; there was no jaundice; the heart, lungs, liver, and spleen were apparently normal; the abdomen showed a visible prominence in the median line, midway between the ensiform cartilage and the umbilicus. Upon palpation, this proved to be a hard, irregular mass, with a sharp lower edge; it was not tender, freely movable, and could be kept down by pressure.

October 16 the stomach was inflated with seidlitz powder, which resulted in a displacement of the mass to the right hypo-

chondrium. There was always some free hydrochloric acid in the stomach washings; lactic acid was absent. October 21 a median abdominal incision was made between the ensiform cartilage and the umbilicus. Upon opening the peritoneal cavity, it was found that the pylorus and walls of the stomach were extensively infiltrated with a carcinomatous growth, which also involved the first part of the duodenum. There were a few enlarged glands in the gastrocolic omentum, near the greater curvature. The greater omentum was freed along the greater curvature of the stomach and tied by chain ligatures. The lesser omentum and duodenum were also freed, and after clamping the latter, together with the involved pylorus, the tumor was excised. The operation was performed by Kocher's method, about one-third of the stomach being sacrificed. The duodenum was then implanted into the original wound made in the stomach, and interrupted silk sutures applied; these were reinforced by continuous Lembert silk sutures, and the upper half of the stomach wound was closed in the same way. A thin cigarette drain was introduced above and below the suture line. With the exception of a small leak at its upper extremity, the wound healed without complication. Since the operation, the patient had gained thirty pounds in weight. The pathologist reported that the growth was an adenocarcinoma.

LIGATION OF BOTH COMMON CAROTIDS.

DR. LILIENTHAL presented a woman, eighteen years of age. Nine years ago she lost the hearing of her left ear, and began to suffer from a continuous buzzing noise in the left side of the head. The corresponding mastoid was operated on, but no improvement resulted. Two years ago, a double exophthalmus developed, more marked on the left side. The buzzing noise in her head had gradually grown louder, preventing sleep. She also suffered from constant headaches. Her eyesight was unimpaired; there was no diplopia nor goitre.

When the patient was admitted to the Mt. Sinai Hospital, early in November of the present year, an examination of the throat showed that the left tonsil was pushed forward, and posterior to it a large artery could be felt. There was a marked pulsating exophthalmus of the left eye and to a more moderate degree of

the right eye; the pupils were equal and reacted to light and accommodation; the left eye could not be closed. There was a paralysis of the left side of the face. Posterior to and underneath the left ear there was an elongated, pulsating tumor, which became indistinct in the supraclavicular region: it gave rise to a distinct systolic thrill and a loud buzzing systolic murmur. The right jugular vein was prominent and a continuous bruit was present over its course. There was a faint systolic cardiac murmur.

An examination of the left ear revealed a small, rounded tumor of cavernous tissue situated just external to the drum-head, and in both ears the arteries and veins were dilated beyond their ordinary size. In the left ear the veins were almost tortuous in character.

A diagnosis of arteriovenous aneurism, probably in the region of the cavernous sinus, was made, and on November 11 the left common carotid artery was tied. On the following day it was noted that the exophthalmus was less marked and the pulsation of the left eyeball not so pronounced. There was also an immediate disappearance of the tumor underneath the left ear, and this has not returned since. The buzzing noise and the headaches, however, were apparently unchanged. On November 25 the right common carotid was ligated. Both carotids were found to be enlarged, especially that on the right side; its walls were thin, and it presented an anomaly in the fact that it bifurcated very high up. After this second ligation, the buzzing on the right side disappeared completely, but there was still some on the left side. The exophthalmus has markedly diminished and the headaches have practically disappeared. Within the past few days a slight thrill can again be felt on the right side.

PYLORECTOMY FOR CARCINOMA; NO RECURRENCE AFTER TWO YEARS.

DR. F. KAMMERER presented a patient upon whom he had operated for carcinoma of the stomach two years and four months ago. More than one-half the stomach was removed, including the whole of the lesser curvature; the divided ends were then sutured and a gastro-enterostomy done with Murphy's button. Since the operation the man has apparently remained in excellent

health, and there are no evidences of a recurrence. He has not increased in weight, neither has he lost. He claims to be unable to eat meat, but everything else he can digest. He occasionally has a sense of pressure in the region of the stomach. Dr. Kammerer said he had already shown this patient to the Society, about two years ago, in much the same condition as to-day.

THE ESTABLISHMENT OF AN ARTIFICIAL ANUS FOR THE RELIEF OF CHRONIC ULCERATION OF THE LOWER BOWEL.

DR. KAMMERER showed a woman, twenty-eight years old, upon whom he had operated for an ulcerative condition of the upper rectum, sigmoid, and colon by establishing an artificial inguinal anus with a prominent spur, in the right iliac fossa. The nature of the patient's trouble was not apparent. There was no specific history, and she presented no symptoms which could be attributed to syphilis. The trouble had lasted, more or less, for three years. The patient had one healthy child, and had had one miscarriage. There was no tubercular history. The onset of her trouble was gradual. When admitted to the hospital, she was much emaciated; she suffered from rectal tenesmus, with bloody stools, containing mucus and pus in considerable quantity. The lower rectum was free, but beginning some six inches up an ulcerative condition was found with the proctoscope as far as the instrument would reach. The descending and transverse colons were painful to pressure. Antispecific treatment had no effect on her symptoms.

An operation was done May 19, 1902. As soon as the condition of the wound warranted such procedure, irrigation of the lower bowel was practised daily, first with normal salt solution and later on with weak solutions of nitrate of silver, the fluid being introduced into the rectum and escaping by the artificial anus. August 19 the inguinal anus was closed. During the period of treatment, extending over three months, the patient gained about twenty pounds in weight; this improvement has continued, the patient adding another eight pounds to her weight since the definite closure of the anus. She is now in excellent health, and has no pain whatever in the rectum; her bowels move naturally once a day. Dr. Kammerer said he had not made an

examination of the interior of the rectum recently, but it would seem natural to infer that the ulcers, which had healed before closure of the artificial anus, had not since reopened. The speaker said it seemed to him important in cases of this character to establish an artificial anus, and thus prevent any faecal matter from entering the colon. He was inclined to believe that this was an important point, which could not perhaps be as readily attained by operations not entirely excluding the large intestine from the faecal circulation.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, November 3, 1902.

The President, RICHARD H. HARTE, M.D., in the Chair.

PERFORATION OF AN INTESTINAL ULCER DUE TO TRAUMATISM.

DR. GEORGE G. ROSS reported the case of a man, aged fifty-four years, who, while loading a box on to a wagon, slipped and was struck by the box a slight blow on the lower abdomen. He at once experienced considerable pain, nausea, and vomiting. The pain increased steadily until the time of operation. When admitted to the German Hospital about two hours after the accident, he was profoundly shocked and was suffering great pain. The abdominal recti were rigid and the abdomen was retracted. Rectal examination negative; the flanks were tympanitic, and he gave no positive evidence of hæmorrhage. The tenderness was most marked over the lower half of the abdomen. Peristalsis was absent and he could not pass flatus. Purgative enemata were retained. His temperature was subnormal and pulse weak and running. Four hours after his admission his temperature had risen to normal, pulse 104, pain still severe, and the abdomen had begun to distend.

Median incision six inches long. There was some œdema of the abdominal walls. On opening the peritoneal cavity a sero-purulent, non-odorless fluid escaped, but no gas. The surface of presenting knuckles of bowel was injected and covered in places with flakes of lymph. Throughout the small intestines, small, yellowish-white, pearly bodies were noticed beneath the peritoneal coat.

The entire peritoneal cavity was thoroughly and completely irrigated with warm salt solution, the hand being introduced to

manipulate the fluid and force it into all the pockets of the cavity, beginning below in the pelvis, then each iliac fossa, then beneath the stomach and spleen, and finally under the liver and between the coils of bowel. The small intestine was now withdrawn, and beginning at the ileocecal valve was wiped with gauze. About twelve inches from the cæcum a perforation, large enough to admit a lead-pencil, was discovered. It was situated at the side of the bowel one-third of an inch from the mesenteric attachment. The edges of the perforation were everted, so that the mucous coat of the bowel was protruding through the opening. There was no blood in the peritoneal cavity and the edges looked ulcerated and not torn or lacerated. The opening was nearly round. Peyer's patches appeared normal, and, excepting the perforation, the pearly bodies, and some injection, the bowel seemed normal.

The hole in the bowel was closed by Lembert sutures, the pelvis drained by a glass tube, and several wicks of gauze placed so as to drain the iliac fossa. The convalescence was, on the whole, satisfactory. His bowels moved almost daily, and he passed quantities of flatus. The abdomen remained distended and painful for some days after operation.

DR. LE CONTE was of opinion that, from the characteristics which were found at the time of operation, the case must have been one of perforation due to traumatism, and not to ulceration. The fact that the abdominal wall was thickened and œdematous showed that there must have been considerable contusion; and also the fact that the mucous membrane protruded through the opening in the bowel would seem to indicate that the force had spent itself more on the peritoneal and muscular coats of the bowel than upon the mucous lining. Had the perforation been the result of an ulcerating or excavating inflammatory process, there would have been greater destruction of the mucous coat than of the muscular and peritoneal coats of the bowel.

DR. WILLIAM J. TAYLOR referred to a case which he reported some years ago of rupture of the bowel from the kick of a gun. This occurred while a young man was walking across a marsh hunting for snipe. The gun was accidentally discharged and struck him over the right iliac fossa, causing great pain, and making it almost impossible for him to get to his home, which was some distance away. The accident occurred on Saturday afternoon, and he was brought to Philadelphia on the following

Monday, being first seen by Dr. Taylor about eight o'clock that evening, when he was found to be suffering from a violent general peritonitis. The abdomen was immediately opened, and when a slight adhesion between two coils of gut were separated with the finger, the contents of the bowel poured out. Upon examination it was found that a round ulcer had formed, which had so perforated the bowel that it had become adherent to another coil, and the accidental movement of the finger was sufficient to rupture the slight attempt at repair. The patient died in the course of four or five days.

SPURIOUS MENINGOCELE.

DR. HENRY R. WHARTON presented an infant, fourteen months of age, who, when six months old, received a fall, which is said to have resulted in a fracture of the right parietal bone. She was taken to a hospital near her home, and while under treatment there is said to have had a number of convulsions. She was admitted to the Children's Hospital in September of this year, six months after the accident, and presented the following conditions. She presented a fluctuating tumor the size of a hen's egg over the upper and posterior portion of the right parietal bone; the tumor could be reduced to some extent, but became more tense when the child cried, and transmitted pulsation could be detected. There was also noticed marked asymmetry of the face. Examination of the eye grounds was negative. The tumor was tapped and found to contain cerebrospinal fluid. Upon deep pressure a distinct opening in the skull, about two inches in length and one inch in width, at the base of the tumor could be felt with thickened edges.

The case appears to be one of spurious meningocele which has developed after a fracture of the parietal bone; the pathology of the condition is explained by a fracture of the skull, with simultaneous rupture of the dura mater and the effusion of blood beneath the pericranium, causing a hæmatoma which gradually becomes encysted and the subsequent replacement of the blood by cerebrospinal fluid.

The prognosis in these cases is unfavorable, as the tumor gradually tends to increase in size. Various forms of treatment have been employed,—pressure, repeated aspiration combined with

pressure, extirpation of the sac, and closing the gap in the skull by an osteoplastic flap as practised in one case by König.

A spontaneous cure has resulted in some cases, and in early cases compression has been followed by good results. All operative methods of treatment have been followed by a high mortality.

Dr. Wharton said that this case seemed to him to be an unfavorable one for operation on account of the large gap in the skull, and the difficulty of forming an osteoplastic flap of sufficient size to fill the gap.

DR. DE FOREST WILLARD thought that in a case with so large an opening, and probably traumatism as the initial lesion, and with the absorption of the bone which is apparently taking place, any injection operation would be exceedingly unsatisfactory, probably fatal, and certainly not curative. He believed that an excision of the tumor would be followed by failure of reproduction, and that the only operation offering any hope of relief would be an osteoplastic plate covering the bone and giving support after operation. This operation he also felt would be attended by the same risks as any operation of that kind, but as the size of the tumor is constantly increasing and the size of the opening in the skull constantly increasing, he thought that it would be justifiable.

MARJOLIN'S ULCER.

DR. J. CHALMERS DA COSTA read a paper on the above subject, for which see *ANNALS OF SURGERY* for April.

DR. HENRY R. WHARTON stated that his attention was first directed to this condition by a case which he had seen some years ago in the University Hospital under the care of Dr. Ashhurst, the ulcer occurring in the cicatrix of a gunshot wound received in the War of the Rebellion. The case presented all the characteristics which Dr. Da Costa has enumerated. The ulcer was inflamed and painful, and the discharge therefrom was most offensive. Since that time he had seen three typical cases of Marjolin's ulcer, one of which developed in the cicatrix of a gunshot wound also received in the War of the Rebellion, which came under his care at the Presbyterian Hospital, and in which amputation of the leg was performed. Another occurred in a colored woman sixty-three years of age, being located in cicatrized tissue back of the knee, which had resulted from a burn received at the age of twelve years. A few years previous, when the woman was fifty

years of age, there developed a fungous ulcer. In this case an amputation of the thigh was done. Another case occurred in a woman seventy years of age, who gave a history of an ulcerated leg since she was twelve years of age, which had suddenly broken down, involving the leg to the knee-joint. In this case amputation of the thigh was done. These cases all terminated satisfactorily, and, although some of them have been under observation for a number of years, there had been no return of the disease.

DR. G. G. DAVIS stated that if by Marjolin's ulcer was meant any malignant growth following ulceration of the extremities, he felt it was a very remarkable thing that Gross should only have seen three cases in his lifetime. If such was his experience, we would be led to think that these cases are extremely rare. He stated that personally he did not think malignant growths occurring on previously ulcerated surfaces were so extremely rare as this experience of Gross would seem to indicate. He remarked that a few months ago he amputated one leg for carcinomatous growth of the heel following an injury and ulcer which had existed for a couple of years, and he also felt sure that he had seen other cases of this character.

EXTRADURAL HÆMORRHAGE.

DR. JOHN H. JOPSON read a paper entitled "Two Cases of Extradural Hæmorrhage," for which see page 341.

DR. J. CHALMERS DA COSTA referred to a case which had come under his care some time since. It was that of a man suffering from an injury to the skull by being hit on the head with a blackjack, after the administration of knockout drops. Incision into the wound revealed a fracture of the skull and extensive hæmorrhage from a parasinoidal sinus, which was controlled by gauze packing. The patient did well for a number of days. Primary union was complete, except there was a very small fistula. Ten days after the operation the patient became violently insane, imagined that he was being beset and prosecuted, had terrifying hallucinations, and became worse and worse. Da Costa then became doubtful as to how many pieces of gauze he had put in the wound. He could not remember how many he put in, but he knew only one piece had been taken out. By means of a small probe he was finally able to secure a thread through the sinus that remained, and then removed a piece of gauze twelve inches in

length. This case indicates the necessity for extreme care in always noting down the number of pieces of gauze put in a wound for the control of hæmorrhage. The speaker referred to the case of a man who was run down by a bicycle fiend. The man was brought into the hospital speechless and suffering from an injury of the scalp above the external angular process on the right side. He was either unable or refused to write, but made curious signs with his fingers, which were found to be the deaf and dumb language. Another inmate of the institution who understood the sign language was brought into the room, and on attempting to converse with the patient, it was found that he only spoke three words, "how," "what," and "when," which he repeated with his fingers. When asked his name, age, residence, how he was hurt, etc., he would invariably make these same signs with his fingers. The man was operated on and a bit of bone was found driven into the third frontal convolution. When the man returned to consciousness, his wife, who was also deaf and dumb, was there, and he conversed with her with perfect freedom, and the question has presented itself to the mind of the speaker whether the sign language was located in the third frontal convolution on the right side, as seems to be indicated by this case of aphasia to signs, as it might be considered.

DR. JOHN H. JOPSON stated that he believed the method recommended by Dr. Neilson, of controlling the hæmorrhage by means of the ligature, was the best in the cases where it could be practised; but in the first case this was absolutely impossible, as several of the branches of the vessel were apparently torn, and a considerable amount of packing was required. In the second case, a very little packing checked bleeding most satisfactorily, and more bone would have had to be removed than was done to have used the ligature method.

As to the possibility of the production of hæmorrhage without fracture, he believed that that point had been emphasized by Jacobson. As long ago, however, as the time of Charles Bell, he pointed out, if you take a cadaver and strike it a heavy blow on the skull and then inject the carotid artery, you can find evidence that the dural artery or its branches has been ruptured.

The question of the removal of the clot was considered an important one, and it was recommended that an opening should be made in the skull of sufficient extent to thoroughly uncover the

seat of the hæmorrhage, reference being made to a case in which a trephining operation had been done, the clot syringed out, but the true source of the hæmorrhage never uncovered or controlled, and death resulted from further compression of the brain.

DR. HENRY R. WHARTON stated that in his opinion one point which should never be lost sight of in these cases of extradural hæmorrhage was that where the typical symptoms might be located, the hæmorrhage might be from another source, as for instance the symptoms occurring in the right side when the hæmorrhage was in the lateral sinus. He reported the case of a boy who fell some distance and struck the right side of the head, and within twelve or fifteen hours developed typical symptoms of extradural hæmorrhage. Following the external symptoms, a trephining operation was done, including the small fissure of the skull, which was followed backward until the seat of the hæmorrhage was found and an immense clot of blood removed. The hæmorrhage was controlled by packing, and the patient ultimately recovered. In suspicious cases it was thought to be always well to bear in mind the possibility of the lateral sinus being the seat of the hæmorrhage.

DR. TAYLOR stated that in one case which he had reported, a man had been standing at the head of a stairway down which he fell. A history was given of his unconsciousness for a short time, that he recovered sufficiently to get up and walk into a room and sit down, but that in a few minutes he became again unconscious and was sent to the hospital. When first seen he was apparently paralyzed on one side, and had convulsive movements on the other. As he had only one eye, it was impossible to compare the pupils, but his single one was contracted. A trephine opening was made in the skull on the opposite of the paralyzed side in the region of the anterior branch of the middle meningeal artery, but no clot whatever was found. Immediately another trephine opening was made on the opposite side of the head at a corresponding point, and a large extradural clot was discovered. Evidently this clot had produced sufficient irritation to the dura to cause the convulsive movements. The man never regained consciousness and died. It was now learned for the first time that he had been paralyzed on one side some time before the accident, and at the autopsy an old blood-clot was discovered on the brain. The question of diagnosis was here very much complicated by the conditions and by a faulty history.

DR. G. G. DAVIS stated that it was interesting to bear in mind, in reference to the cases of extradural hæmorrhage not from the middle meningeal artery, that they can take place without any fracture being present. He had been inclined to doubt the possibility of this occurrence, but referred to a case which was reported in the *New York Medical Journal* three or four years ago, in which a surgeon diagnosed and evacuated a clot in one of the parietal regions, in which there was absolutely no evidence of a fracture. Since that time he has seen the record of another case in one of the British journals, which would seem to establish the possibility of the occurrence of this condition beyond a reasonable doubt.

DR. T. R. NEILSON stated that he had a number of times to control hæmorrhage from the middle meningeal artery or its branches. He felt that packing by means of gauze is best adapted to intracranial hæmorrhage from the venous sinuses, as he had proven by personal experience on a number of occasions. In hæmorrhage from the middle meningeal artery his practice has been to control it by ligature, not tied over a hæmostatic forceps, but passed around the vessel threaded in a small, full curved needle. Reference was made to a case in which he had found it necessary to plug the foramen spinosum in order to control the hæmorrhage, the vessel being torn across as it emerged from the foramen. The plug used was a match-stick sterilized by boiling. In reference to the removal of clot, he stated that he believed it could be done more easily and more quickly by means of a stream of water from a syringe than by any instrument.

A HOLLOW BONE-DRILL.

DR. J. TORRANCE PUGH presented a bone-drill which he thought would obviate the necessity of groping about with a wire to find the hole made by it.

It is made in four parts, viz., a straight handle which has a hole running longitudinally through the centre; the "bit," which also has a hole drilled through it lengthwise and coming out about one-sixteenth of an inch from the lower end on one of the grooved sides; a set-screw, to hold the bit in place; and a trocar to close the lower opening, and so prevent the lumen of the canal from being choked with bone chips. A short screw-thread holds the trocar fixed in its position.

After the parts are put together, the drill is pushed through the bone, the trocar is withdrawn, and the silver or other wire pushed through the centre of the drill and caught on the other side of the bone. The drill is then withdrawn on the wire, the



Hollow bone-drill.

trocar again inserted in its proper place, and the bone drilled on the other side. The trocar is then withdrawn, and the end of the wire inserted into the opening in the one side of the drill, and as the drill is withdrawn, the wire is pushed through with it and follows it, as it were.

The hole cannot clog or choke with bone-borings because of the trocar, and this most troublesome feature of all such instruments is thus overcome.

A TWIST DRILL BONE-NEEDLE.

DR. H. AUGUSTUS WILSON exhibited a twist drill bone-needle which is an ordinary twist drill of commerce with an eye made in each end. It may be used like an ordinary needle or by means of the eye in the point by being passed through the bone, the suturing material inserted in the eye and withdrawn. To facilitate



Twist drill bone-needle.

the use of this bone-needle, a jeweller's vise was shown which is made with a hollow handle, so that the suturing material may be in place ready for use. This vise is readily sterilized. The twist drill bone-needle has the advantage of making a very small hole in the bone, which is necessary in suturing the smaller bones, for instance, the clavicle. By means of this needle any suture material can be employed.

Stated Meeting, December 1, 1902.

The President, RICHARD H. HARTE, M.D., in the Chair.

HIP-JOINT AMPUTATION FOR TUBERCULAR DISEASE OF THE FEMUR.

DR. DE FOREST WILLARD presented a woman, fifty years of age, who was admitted to the Presbyterian Hospital, October 21, 1902, with the history that for forty-two years she had had tubercular osteitis of the left femur,—first at knee, then thigh, then hip. Numerous sinuses had formed from time to time at various points in the thigh, sometimes healing, then reappearing. One year ago she fell, and either broke the femur at lower end or tore the ligaments at the knee, so that the leg now bends outwardly at an angle of forty-five degrees to the femur; limb perfectly useless. Pus discharging sinuses at various points between knee and hip-joint. Increased pain and discomfort both at lower and upper ends of femur. The tissues throughout the entire thigh dense and indurated from tubercular deposit. Knee-joint rigidly fixed. As the limb had been useless for years, and as there was no possibility of her ever employing it for locomotion except with crutches, the patient readily consented to a hip-joint amputation.

Operation.—Three Wyeth's pins used, anterior one entered below anterior superior spinous process, and emerged near the vulva, passing close to pubic ramus and beneath femoral vessels. Around the head and point of this pin was carried ovally an elastic tubing, thus compressing the femoral vessels independently of the encircling tubing, which was afterwards applied. The anterior flap was made irregular in shape to avoid the pus sinuses; the femoral vessels were tied with catgut before disarticulation of the joint; posterior flap also cut and vessels tied, as the tissues were densely infiltrated. Upon removal of the tourniquet, less than one drachm of arterial blood was lost, the only hæmorrhage being the venous blood in the leg itself, which, on account of the pathologic conditions, had not been pressed out by elastic bandage. Wound closed with silkworm gut, posterior drainage being provided for by an independent opening through the buttock.

Animal heat had been economized during the operation by

placing the patient upon an electrically heated mattress, and by her body having been wrapped from neck to feet in cotton wadding. She left the table with a temperature of 99° F. Whiskey and water enemas had been given just previous to the operation; also, hypodermics of strychnine and morphia.

Her operative recovery was retarded, as the wound became infected from the old pus sinuses, which delayed the healing. The blood supply for the body was abundant, as the circulatory system was relieved of one-sixth of its requirements.

SPINA BIFIDA.

DR. WILLARD presented a girl, aged seventeen years, height four feet eight inches, fairly well developed, who was admitted to the Presbyterian Hospital, October 9, 1902, with a history that since infancy she had been unable to walk without apparatus or crutches. History vague, but, as far as she could remember, she had been operated on six times for correction of feet and leg deformities.

At time of admission she had trophic ulcers on the soles of the feet, and bore the scars of several tenotomies; also on the right foot the scar of a probable wedge-shaped excision of the outer side of the tarsus. The right foot, however, still presented a bad talipes varus. Foot very short and stumpy and incapable of bearing weight. Left foot markedly valgic, so that the inner malleolus came close to the floor. The great toe had been removed for trophic changes or necrosis. Legs and thighs feebly and illy developed. Sensation markedly absent, so that operations on the foot have been done without ether, yet without the patient complaining of any pain. Legs incapable of bearing weight of body without support of hands or of crutches. Muscular contractility very feeble in left leg, moderate in right; had control of bladder and rectum.

The appearances were indicative of a lack of nerve supply from a spina bifida, and upon examining her back a large, soft swelling, resembling a fatty tumor, was found over the sacrum; in its centre was a marked dimple, but the tumor did not project like an ordinary spina bifida, but was flattened out like a saucer, and while four or five inches in diameter was not elevated more than an inch, being spread out over the sacrum. A very slight depression could be felt over the spinal canal, but no large open-

ing could be discovered, and pressure upon the tumor gave no pain, headache, or discomfort to the patient. There was no abnormal growth of hair over the region.

As there had been a previous unsuccessful wedge-shaped tarsotomy, the astragalus of the right foot was removed in order to allow the member to be brought into a straight position, with the sole well down upon the ground. No anæsthetic was required, and the patient complained of no pain. Catgut drainage and catgut sutures were employed, and foot dressed with plaster of Paris. In the left valgic foot the tendon of the peroneus longus was divided, and an osteotomy of the fibula performed one inch above the malleolus. The foot was then forcibly inverted and confined in this position by a gypsum dressing. The bandages were not removed until the end of the fifth week, when the wounds were found perfectly healed. The right foot was in such good position that it will probably not require apparatus, but the left will need a valgic support at the inner ankle. The limbs are so feeble from their lack of nerve supply (a portion of the cord having probably been lost in the tumor) that she will require the assistance of crutches, at least for a time.

As the opening in the spinal canal had apparently closed, there seemed to be no benefit to be secured by operative treatment upon the spina bifida occulta.

GUNSHOT WOUND OF FOREARM.

DR. WILLARD presented a boy of fourteen, who had been injured by discharge of a shotgun at close range. The entire upper middle region of the right forearm was torn away, leaving only the ulna. About four inches of the radius were destroyed, together with the radial and interosseous arteries, the radial and median nerves, and the entire muscular and tendinous structures. The ulnar vein was also wounded and a large branch of the ulnar artery also injured.

At first sight it seemed that an immediate amputation was necessary, but from past experience, knowing the recuperative power of the adolescent, and with the fact that a hand and forearm even though rigid and distorted are more serviceable for work than an artificial member, it was decided to attempt to save the arm. Many shot were removed; the area sterilized; torn tendons and nerves were united as far as possible. The question of

immediate excision of the ulna to accommodate its length to that of the destroyed radius was considered but abandoned, since the excision of four inches would have so folded what was left of the ulnar circulation, that it would certainly have impeded the slight remaining current. The arm was put upon a splint with thorough antisepsis. Patient was critically watched for the next week. The hand became very black, but no blebs appearing, amputation was deferred from day to day. The result at time of report, four weeks after the injury, is that no area has become acutely gangrenous, but there has been a dry, hardening gangrene which is now limited to the tip of the pulp of his little and third fingers and the last phalanx of the thumb. An amputation of the latter member will give him one phalanx of the thumb, which with even stiff fingers will prove very helpful, even if but slight motion is secured, and though the hand and arm will necessarily be very useless, yet will answer for many kinds of work. As the boy still has several years of growth before him, it is probable that the elongation of the ulna will distort the arm, but a future resection of the bone can readily be done when needed, and if trophic changes occur from destruction of nerves, an amputation in the future will leave him no worse than would have been the case had an operation been done at once.

SIMULTANEOUS RUPTURE OF BOTH QUADRICEPS EXTENSOR FEMORIS TENDONS.

DR. HENRY R. WHARTON presented a man, aged sixty years, who, in stepping from a trolley-car on the evening of June 12, 1902, alighted upon a pile of sand and experienced a sense of something giving away in the knees. He did not fall at the time, but when he attempted to walk, fell, as the limbs seemed powerless. He was removed to his home and was examined by his family physician, who found the knees greatly swollen, with marked disability as regards extension of the knee-joints. He was treated by fixation of the knee-joints and the use of evaporating lotions: but when the swelling had subsided it was found that there was no improvement in the power of extension of the knees. Dr. Wharton saw the patient in consultation with his family physician on July 12. Upon examination, a marked depression over both quadriceps extensor tendons, about one and a half inches above the patella, was evident in each limb. There was at this time

complete loss of the power of extension of the knees. A rupture of both quadriceps extensor tendons had occurred, and there had been no attempt at repair under fixation of the joints.

The patient was removed to the Presbyterian Hospital, and on July 21, after careful preparation of the limbs, a longitudinal incision, four inches in length, was made over the position of the rupture in each tendon, and the ruptured ends of the tendons were exposed about one and a half inches above their insertions into the patella. The gap between the ruptured ends of the tendons in each case was filled with a blood-clot and synovial fluid. The bursæ above the patella were ruptured, and a portion of the blood-clot extended under the patella and into the knee-joints. The ends of the tendons were freshened, and in accomplishing this it was observed that there were bony deposits in the tendons, which was probably a predisposing cause to their rupture. The blood-clots were carefully removed, and after freshening the ends of the tendons the surfaces were brought into contact by the introduction of four heavy chromicized catgut sutures. Some force was required to bring the edges in contact, on account of the gap which existed. The most scrupulous care was exercised as regards asepsis during the operation. The fibrous tissues over the tendons were brought together with buried sutures of fine catgut, and the external wounds were closed with silkworm-gut sutures without drainage; a sterilized dressing was applied, and the limbs were enclosed in plaster-of-Paris dressings extending from the toes to the groin.

The patient ran a perfectly satisfactory course after the operation, with scarcely a rise of temperature above the normal. The bandages were trapped on July 31, ten days after the operation, and, as the wounds were healed, the sutures in the external wound were removed. The plaster bandages were removed on August 9, and the union in the tendons at the seat of operation was found to be firm. Plaster bandages were reapplied and remained for two weeks, and were then removed, and a pair of laced knee-caps applied. The patient was then gotten out of bed and allowed to walk with crutches. He was soon able to walk with the use of a cane only, and rapidly regained the use of the limbs. By October 15 he could walk without any artificial support, and the restoration of function was complete.

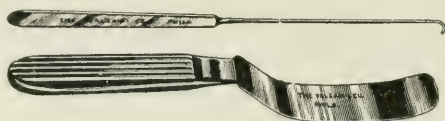
DR. W. BARTON HOPKINS recalled a rupture of the ligament

of the patella that he met with some years ago. The injury was the result of muscular violence, and the patella was found to be drawn up the thigh at least five inches above its normal position. The patient was admitted to the Episcopal Hospital a few hours after being injured, and was immediately operated upon. The patellar ligament was found to be ruptured and the patella entirely denuded of its periosteum and dragged up the thigh. The tendinous covering of the bone was left attached to the tendon above. The wound healed perfectly and functional restoration was complete. Dr. Hopkins said that rupture of either the ligament of the patella or the tendon of the quadriceps is interesting because of the greater frequency of fracture of the patella when the structures in question are subjected to a breaking strain. During his experiments to determine the tensile, transverse, and crushing strength of bones, he found that the patella resisted a tensile strain of 1845 pounds, when the ligament parted. The pull was a steady, straight one, however, with no tendency to flexure of the joint or to impact upon the bone which is often present in cases of fracture. The tendon and ligament during the experiment were attached by straight iron clamps so arranged that crushing was avoided. The ligament parted at a point some distance from the clamp, showing that the instrument had no part in producing the rupture. In all cases of ruptured tendons or ligaments, operation, in his opinion, is the only method of cure, and should be performed as soon as practicable.

RETRACTOR OR ELEVATOR FOR OPERATIONS UPON THE BASE OF THE BRAIN.

DR. CHARLES H. FRAZIER presented an elevator for use in operations at the base of the brain. He said that only those who have had occasion to approach structures at the base of the brain realize how necessary it is that the operator, at least, should be afforded an unobstructed view of the structures, and how difficult it is in many cases to secure proper exposure. Two factors interfere with the surgeon's view of his field of operation,—hæmorrhage and the brain itself. Hæmorrhage can be controlled by pressure applied through strips of iodoform gauze. The brain must be elevated or retracted, and in such a way as to cause the least degree of compression and contusion to the cerebral tissue, and avoid laceration to the dura should that structure be still

intact. In his operations upon the sensory root of the Gasserian ganglion he had been hampered by having his view wholly or partially cut off and his manipulations interfered with by the hand grasping the retractor, whether it be the hand of the operator or the hand of an assistant. With a view towards removing this obstacle or annoyance, he had had constructed by the Valzahn Company of Philadelphia a special retractor (see figure). Its important features were the shape and the thickness of the blade. For a distance of three centimetres from the handle the axis of the blade forms with the axis of the handle an angle of 145 degrees, so that when the instrument is in use the hand grasping the retractor is so situated as not to interfere between the surgeon's eye and the field of operation. The remainder of the blade is eight centimetres long, follows a curve very slightly concave



Brain elevator.

except at the tip, where the curve is a little more exaggerated. The blade is thin enough to yield somewhat under the pressure that would be exerted upon the dura and brain, and thus adapts itself more or less evenly to the surface to which it is applied, and thereby subjects the brain to a uniform degree of pressure. This retractor or elevator may be used in any operation which requires an exposure of the base of the brain, whether it be one for removal of tumors or for the extraction of the ganglion or division of its sensory root. It is more particularly with the latter class of cases that he had employed the instrument and found it so useful.

The other instrument shown in the illustration above the retractor is a hook which he had had constructed for his operations upon the sensory root of the Gasserian ganglion. After the root is exposed, it is picked up with the hook, grasped with hæmostatic forceps, and divided.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, December 1, 1902.

The President, JOHN B. MURPHY, M.D., in the Chair.

CARCINOMA OF THE LARYNX.

DR. ARTHUR DEAN BEVAN presented a man from whom five months before he had removed a carcinoma of the larynx by the method suggested by Keen, of using no tube during or after the operation, making a complete removal of the larynx, bringing the trachea into the wound, and stitching it in that position. The man has since learned to talk so that he can make himself understood at a distance of eight or ten feet, and he is improving rapidly in his method of speech without any larynx. The speaker was convinced that, after a more careful study of these cases, it was by all odds better to allow these patients to learn how to talk without an artificial larynx.

REPORT OF SIXTY CASES OF ACTINOMYCOSIS.

PROFESSOR R. VON BARACZ, of Lemberg, Austria, read a paper with the above title, for which see page 336.

DR. WILLIAM T. BELFIELD said that soon after the discovery of the ray fungus, he was in Vienna, in 1882, and saw cases of actinomycosis there, and soon after returning to this country he was called upon by the Health Commissioner of Chicago to investigate the nature of certain diseases of cattle at the stock yards, which he did, and found it to be actinomycosis. He thought this was the first recognition of the disease in this country. Soon after the first case of actinomycosis in the human subject in this country was recognized by Dr. J. B. Murphy.

Dr. John L. Sawyers, of Centreville, Iowa, had reported some eight or ten cases of actinomycosis which had come under his

observation, and had drawn attention to the value of subcutaneous injection of weak solutions of iodide of potassium. The iodides had long been used by various Continental surgeons, and hypodermic injections had been used by Rydygier, among others. Sawyers in one case had really cured a case of actinomycosis of the lung by the intrapulmonary injection of weak solutions of iodide of potassium, something like one grain to the ounce. He had not seen this method of treatment recommended by others.

DR. A. J. OCHSNER described a case which he first saw in 1886, at which time the disease appeared in the upper jaw. The cavity was curetted and treated with iodine and iodoform gauze packing. After the patient had recovered from the actinomycosis of the upper jaw he went to Texas, and after a few years died, probably of actinomycosis of the lung.

He had used iodide of potash in a number of cases of actinomycosis before investigating the manner in which veterinary surgeons use it in cattle, and then he learned that, so long as no abscess had formed, the iodide of potash in cattle, if used properly, would almost surely effect a cure. The manner in which it was administered was very simple. The animal was given a large dose of iodide of potash for a number of days in succession in food; then an interruption of three weeks is made, and a large dose given again each day for three successive days; then another interval is made, after which another large dose is given as before. In one case of actinomycosis of the cheek which had extended upward and had dissected away the ear and one-third of the scalp, he used the iodide of potash in reasonable doses, up to thirty grains three times a day for a period of one month, without the least benefit. There was advancement of the disease, and it was thought that further operation would be necessary; but, profiting by the experience of veterinarians, he put the patient on ninety grains of iodide of potash three times a day for four days, then allowed him to go three weeks, at the end of which time the dose was repeated, and the patient had been well for eight years. So long as there was no abscess present, these patients invariably recovered. As soon as there was abscess existing, the conditions were entirely different. He had observed four or five cases corresponding to the case which Professor Fütterer demonstrated before the Society on a previous occasion, the patient having apparently recovered, but there was a recurrence of the disease,

followed by death. At the autopsy an abscess was found filled with actinomyces. The difficulty in this case was a location in which the actinomyces could remain reasonably safe from the effect of the iodide of potash. In this case, too, there was an empyema. At the time of the operation there was actinomycosis of the colon, which had entirely healed, but the cavity containing the actinomyces had started the disease again. After taking these remedies in the manner mentioned, the patient remained apparently well for nearly a year. He did not remember the exact facts, but they were on record. And so it happened with the other cases in which there was a place where the actinomyces could remain away from the circulation, in which the iodide of potash was carried; so that in his experience the disease had disappeared by giving patients ninety grains of iodide of potash, three times a day, in milk, followed by a pint of hot water. The patients would take it well for three days, then they were allowed to go without it for four days. The dose was repeated a number of times at intervals. Under this method of treatment he recalled a number of patients who had been well for a considerable time, one since 1892.

In intestinal actinomycosis, if one depended upon the iodide of potash, he obtains much better results than by making a radical operation. For instance, he had a patient in mind with severe actinomycosis involving the entire appendix, together with the surrounding tissues which were adherent to each other. It was an acute attack of appendicitis apparently, but the child had had the actinomycosis for a long time. The acute attack was simply an obstruction due to the accumulation of infection of the surrounding tissues. In opening the abdomen he came down upon a mass of actinomycotic tissue, washed it out with tincture of iodine, tamponed with iodoform gauze, gave the child the regular treatment of iodide of potash, and it had been well for four years. Cases of actinomycosis involving the small intestine in which a radical operation was made were liable to die of starvation because of the incurable fistula which usually occurs.

DR. ARTHUR DEAN BEVAN asked whether there was any possibility of the X-ray being of service in cases of actinomycosis. A somewhat similar condition was blastomycetic dermatitis, in which iodide of potassium was of great value, and yet it had recently been demonstrated that the X-ray was a valuable adjunct

in treatment, that is, a combination of the iodide of potash and the X-ray had resulted in cleaning up cases of blastomycetic dermatitis more rapidly than any other mode of treatment. While he had never used the X-ray in actinomycosis, he thought a combination of the iodine and the X-ray might be worth trying.

DR. OCHSNER stated that in one case of actinomycosis of the upper jaw he had used that form of treatment, and in a short time the patient became well, and it was now over a year that he had remained so.

DR. MALCOLM L. HARRIS stated that during the past summer he had had a case under observation in which the abdominal wall was involved, the disease having started apparently in the pre-vesical space. The patient was a young man. The disease appeared first as a slow-forming abscess; the abscess was opened, cultures were made, and the staphylococcus albus obtained. There was a very small amount of pus, with a large amount of hard exudate, and in the pus were little granules which, under the microscope, proved to be actinomyces. He had, therefore, in this case a mixed infection. As soon as the actinomycosis was recognized, the patient was placed on the iodide treatment, both internally and locally. The condition, however, progressed, the disease extending about the abdominal wall up as far as the umbilicus and laterally to the inguinal region. No apparent improvement was noticed from the iodide, although he gave it in very large doses continually. The patient was then given daily treatments with the X-ray, the iodide being used internally and locally at the same time. Some of the hardness of the abdomen seemed to disappear after two or three weeks of treatment with the X-ray; but the general condition of the patient constantly declined. He was under treatment between four and five months, the diseased area extending with the use of the X-ray and the iodide. The patient was then removed from the hospital, and he lost sight of him. From the steady onward march of the disease, he did not think the patient could live a great while.

DR. WILLIAM E. MORGAN within the last year or two had seen three cases of actinomycosis, one of which was appendiceal, which he was enabled to follow to the end and succeeded in getting a very thorough post-mortem examination. Under enormous doses of iodide of potassium, running them up as high as 360 grains in twenty-four hours, and continuing, not only for

days, but weeks, without any apparent improvement. The man finally died of general marasmus. The notable thing that impressed itself more on his mind than any other one feature in this case was the marked anæmia, and yet, when it came to examining the blood count, he found it almost normal at all times.

In the other two cases of actinomycosis which he had seen within the last twelve months, both began in the mucous membranes of the lower jaw, and subsequently involved the neck. One of them was now under his observation, but would very soon succumb to involvement of the lung, which became very early implicated. Of these three cases, two had fistulæ, and he supposed all of them had what might be considered abscesses, because they had fistulæ. There was softening and breaking-down, so that there were cavities as large as a peanut, and in the deep muscles of the flank in the lumbar region there was one spot as large as a hickory-nut, where there was a great deal of softening. In the neck cases both had fistulæ, one fistula opening directly into the mouth.

His experience with iodide of potassium in these three cases had been disappointing. In the abdominal case he was impelled to use the X-ray to some extent, but not a great deal, as the patient complained of increase of pain following X-ray treatment, which was contrary to the use of the X-ray in other tumor formations. After each sitting the patient was in great distress for twenty-four hours.

DR. EDWARD H. OCHSNER had had occasion to look up the literature of this subject, and found it very meagre on three very important points. The first point he mentioned was that whenever there was secondary infections, the prognosis was much worse; that whenever there was a likelihood of repeated secondary infection it was still worse. In actinomycosis of the intestinal tract and of the lung this was a constant recurring danger. There was a constant repetition of secondary infections of various kinds. He thought this was one reason why actinomycosis of both the intestinal tract and of the lungs was generally fatal, and it was a point from which a lesson could be drawn. It was just as important to do an operation upon the actinomycotic area with the greatest asepsis and care as it was to do a laparotomy aseptically, because, if the patient was treated aseptically during the whole period, the chances for recovery were greatly increased.

Another point was the necessity of interrupted iodine treatment. He did not know exactly why this made a great difference, but it certainly did so. If the iodine treatment was interrupted, the actinomycotic areas became again pervious to the blood current, and in that way the actinomyces were killed.

A third important point had been alluded to by his brother, namely, the importance of seeing that there are no abscesses which the blood current, containing the potassium iodide solution, could not get at. If abscess existed, there would constantly remain particles of infected material in the centre, to which no potassium iodide in solution in the blood could reach, and consequently there was continuous reinfection. If these abscesses could be opened and treated aseptically, then the chance for recovery was excellent. If they could not be gotten at for some anatomical reason, or were overlooked, the case would terminate fatally.

DR. VON BARACZ urged the members to try the treatment he had recommended, namely, injections of nitrate of silver. In one case of not extensive actinomycosis of the cheek he injected only one grain of the solution by means of a Pravaz syringe, and it cured the patient. He mentioned one case that was cured by two injections, and another by three injections.

As to injections of tincture of iodine, he used small doses, say about two grains, of the pure tincture of iodine, but a cure could not be effected so promptly.

As to the treatment of cases of actinomycosis of the lungs, he might try the method recommended by Credé in cases of septicopyæmia, which consists in the intravenous injection of colloid silver (collargol), as the great value of nitrate of silver in actinomycosis was already known.

With reference to the injection of iodide of potash, referred to by Dr. Belfield, he said this treatment was recommended in cases of actinomycosis some ten years ago by a foreigner.

FIBROMA OF THE OVARY.

DR. D. W. GRAHAM reported a case of fibroma of the ovary. The patient was thirty-eight years of age; single. She had been in poor health for the last two years; bedridden for the last six months; no menstruation for two years. A tumor of the pelvis was discovered one year previously, which had gradually enlarged. Physical examination disclosed a large, hard, somewhat movable

tumor in the lower abdomen with considerable ascitic fluid. Normal cervix and normal uterine cavity.

Operation, October 31, 1900. A large quantity of straw-colored fluid escaped. Tumor globular and as large as an adult head. Intimate and extensive adhesions to the sigmoid colon, the pelvic brim, and the left iliac fossa. Tumor was attached to the right broad ligament and Fallopian tube, from which it was ligated off. No pedicle. In separating adhesions from the sigmoid, a rent was accidentally made, through which some faecal matter escaped during the operation. The mesosigmoid seemed to be wanting, or was spread out over the tumor. The left ovary was hard and atrophied; uterus was normal in size, movable, and had no connection with the tumor. Two or three small fibroids were situated on the posterior surface of the uterus. Tubular drainage. Patient died on the fifth day after operation. Post-mortem examination showed an acute fibrinous purulent peritonitis, with a necrotic opening in the wall of the sigmoid corresponding to the adhesions. The slough of the sigmoid wall with the consequent leakage and peritonitis is sufficiently accounted for by the destruction of the mesocolon and the arterial supply of the bowel wall during the operation, although all proper effort was made to repair the damage and to supply peritoneal covering for the extensive rawed surface. Probably exsection of the loop would have given a better result.

Dr. Hektoen's note on the tumor says, "On section, an irregularly arranged anastomosing-outbranching system of glistening fibrous bands was observed, surrounding in places yellowish gelatinous areas." Microscopical examination showed true fibroma. No traces of ovarian tissue were found.

Dr. Reuben Peterson, of Ann Arbor, Michigan, had recently published a paper in which he had analyzed eighty-four cases of fibroid tumors of the ovary, eighty-two of this number having occurred in the practice of others, and two in his own practice, which were recently operated upon. His statistics show that the average age of patients with fibroma of the ovary is somewhat less than the average for patients with fibroid tumors of the uterus. The largest number in the eighty-four cases were between the ages of forty and fifty; the next largest between thirty and forty; the next between twenty and thirty.

As to ascites, the analysis of Peterson shows that about 40

per cent. of cases of fibroma of the ovary have considerable ascitic fluid, as was also found in his (Dr. Graham's) case. Dr. Senn in his work on tumors reported two cases, and mentioned ascites as a diagnostic sign as between fibroma of the ovary and fibroma of the uterus.

The question as to what caused the ascitic fluid in such a large proportion of cases was not definitely or satisfactorily determined; but it was stated that the probable cause was the movement of the tumor in the abdominal cavity.

In the speaker's case, and in some others he had investigated, the tumor was more or less fixed. He thought it would be found that the tumor was fixed or partially so in as great proportion of cases of fibroma of the ovary as it would be in fibroma of the uterus.

As to the differential diagnosis, there was no way of determining before operating whether one had an ovarian or uterine fibroma to deal with, in the majority of cases; certainly not where the tumor was as large as in this case, and adherent.

UTERINE FIBROMA.

DR. GRAHAM showed this specimen in connection with the first one, the chief peculiarity being the very large, long cervix with a sessile, submucous tumor the size of a hen's egg attached to the posterior cervical wall near the internal os. The body of the uterus showed two intramural tumors half as large as that in the cervix, and a number of smaller ones. The patient, aged thirty years, a nullipara, sought operation on account of excessive persistent hæmorrhages. When the specimen was fresh, it seemed to show the site of the hæmorrhages to be at the upper border of the cervical tumor just without the internal os. An abdominal hysterectomy was done, as the operation of choice, for want of room by the vaginal route.

SACCULATED BLADDER.

DR. GRAHAM reported the case of a physician, over seventy years of age, who had been using a catheter at intervals for a number of years. The patient would often pass the catheter without being able to withdraw a drop of urine. He had passed the catheter for him at times and could not obtain any urine, yet the patient would be satisfied that his bladder was full. At such

times, after waiting and walking around for a few minutes, the reintroduction of the catheter seemed to act as a stimulus, and as much as a quart of urine would be passed at one time, even though the catheter should be immediately withdrawn. The condition of things was not clear until after the death of the patient, when an examination of the bladder was made, and the bladder cavity found very small, its walls very thick and dense. It had the appearance of a uterus almost, and was not much larger. In the posterior left wall of the bladder was an opening about the size of a lead-pencil, as if punched out. When dissection was made, a large pouch was found behind the normal bladder, filling up the pelvis.

APPENDICITIS FOLLOWED BY SUPPURATIVE PYLE-PHLEBITIS.

DR. GRAHAM described a case of appendicitis operated on the fifth day after the onset of the disease. The abscess was of the usual type; the appendix was removed, and drainage resorted to. Patient improved for a few days, but pulse did not become normal. It continued high, varying at first from 100 to 120, and later from 120 to 160, with all the characteristic symptoms of pyæmia. In the course of three or four weeks the patient had pain in the left hypochondriac region. The left pleural cavity was explored for purulent fluid, but none was found. The liver was explored with an aspirating needle, and no fluid found. He had suspected suppurative thrombophlebitis of the portal veins, with abscess of the liver, when the patient's condition failed to improve. Patient died in about ten weeks from the time of the operation.

At the autopsy a part of the liver and a part of the spleen were obtained. The spleen was found to be extensively necrotic, and in a suppurative, gangrenous condition. There was no abscess of the liver, but he could squeeze out pus from the branches of the portal veins on the liver section. It was a typical case of suppurative thrombophlebitis of the portal veins, extending up into the liver and indirectly to the spleen, without distinct abscess formation in the liver. Statistics showed that about 4 per cent. of the deaths from appendicitis were due to this cause.

LARGE CARBUNCLE.

DR. GRAHAM presented a large carbuncle which he had excised in its entirety. He exhibited it for the purpose of empha-

sizing a method of treating carbuncles which was advocated by him in a paper ten or twelve years ago. Every case of carbuncle that had come under his care he had extirpated just as he would extirpate a tumor, a gangrenous appendix, or a gangrenous limb. If this method were pursued in every case of carbuncle and in the early stage, the surgeon would prevent much trouble, and no patient would die of the disease. If one waited for a carbuncle to slough, an enormous wound would be left, with a long convalescence, even if the patient escaped fatal septicæmia. The proper way to treat a carbuncle is to make a crucial incision beyond the periphery of the tumor, turn back the four flaps and remove the mass as a whole. No one would hesitate to do this if it is recognized that the periphery is the active, aggressive part of the disease, and that the tension of the dense, overlying tissues is the chief factor in spreading the infection. If it is good surgery to amputate a gangrenous limb instead of waiting and watching it slough off and the stump cicatrize by nature's processes, by the same token it is good surgery to make a radical, complete extirpation of every carbuncle as soon as the diagnosis is made instead of temporizing and tinkering with, or even curetting out, the central slough.

LEFT-SIDED SUBPHRENIC ABSCESS.

DR. DANIEL N. EISENDRATH reported a case of left-sided subphrenic abscess. The case was admitted to the service of Dr. Greensfelder at the Michael Reese Hospital, August 14, and was operated on for appendiceal abscess. Patient did well for a few days, then symptoms of infection began to manifest themselves. Temperature continued high, and the patient was apparently in the midst of another infection of appendicitis. The abdomen was reopened; the appendix was removed, and it was thought that the temperature would now decline, but in spite of that sepsis continued. The speaker took charge of the surgical service on the first of September, and found the patient septic. The leucocyte count was 21,000. In looking for the source of the sepsis, he found an area of dulness over the lower lobe of the left lung, inserted a needle, and withdrew foetid pus. He entered the pleural cavity, but found an abscess situated below the left dome of the diaphragm. He opened the abscess by the transpleural method. The abscess was situated between the spleen and left lobe of the

liver and below the left dome of the diaphragm. For a few days thereafter the septic symptoms disappeared, but recurred again, and the patient died about two weeks after operation. An autopsy was not permitted.

This was the second case that had been reported of left-sided subphrenic abscess. The first case was reported in the month of August of this year in the *Boston Medical and Surgical Journal*.

DR. ARTHUR DEAN BEVAN was not willing to accept the diagnosis of left-sided subphrenic abscess in the absence of post-mortem evidence. Surely, in view of the great rarity of left-sided subphrenic abscess from an appendix lesion, and in the absence of a post-mortem examination, this case could not be admitted into the literature with the diagnosis proposed. Every one who had operated on subphrenic abscesses by the transthoracic route knew how limited was the view of the surrounding organs, obtained at the time of operation, and how difficult it was to determine the extent and source of the lesion. There were so many possibilities in the case that had not been excluded, and could not be excluded, without a post-mortem, that the diagnosis proposed was not warranted. Some of these he would mention: First, that the pus found was the widely distributed pus of a general peritonitis; second, it was but one of the evidences of a pyæmia; third, it was secondary to an infection of the spleen; fourth, it was secondary to an infection of the left pleura or lung, etc. He had no desire to be hypercritical, but was unwilling to accept the diagnosis, which he thought was based on insufficient data.

DR. EISENDRATH stated that there was no question at all about appendicitis in this case, and he thought Dr. Greensfelder would bear him out in that statement, as he operated on the case twice, and there was positive evidence of appendicitis.

DR. GREENSFELDER said the patient was admitted to the hospital in a septic condition; he was suffering from general septic peritonitis, so that operation was deferred. It was not deemed advisable to operate. Patient was placed in bed on supporting treatment; no food was given per mouth, but patient was fed by the rectum for two or three days. The symptoms increased in severity; the temperature rose, and pulse became very much accelerated. At the first operation a simple incision was made, and pus evacuated. The patient went into collapse after the first operation, and was transfused with normal salt solution for days.

At the expiration of a week the symptoms had not abated. The temperature was high. For the first twenty-four hours it was 106-7° F.; pulse, 130 to 140. At the second operation the appendix was found gangrenous, its tip being separated from the appendix itself for a distance of half an inch. A Mikulicz drain was introduced, and at this time the case came under the care of Dr. Eisendrath.

DR. EISENDRATH called attention to the fact that there was absolutely no rule that a subphrenic abscess following an appendicitis must necessarily be on the right side. The speaker quoted from an article in the *ANNALS OF SURGERY* in support of his contention. He could not see how the anatomical distribution had anything to do with it. The micro-organisms could easily gain access to any portion, become encapsulated, and the process be latent, to be rekindled at some later period. He said there was not the slightest doubt that this abscess was secondary to the appendicitis, and of its being a portion of a generalized suppurative peritonitis located at this particular place.

REVIEWS OF BOOKS.

A TEXT-BOOK OF PATHOLOGY AND PATHOLOGICAL ANATOMY.
By DR. HANS SCHMAUS. Translated from the sixth German
Edition, by A. E. THAYER, M.D. Edited by JAMES EWING,
M.D. Philadelphia and New York: Lea Brothers & Co.,
1902.

This work has enjoyed a high degree of popularity as a text-book among the students of medicine in Germany. It fills a peculiar position of its own. Most of the other German works on pathology are works of reference rather than text-books. In this book there is a more compact, but fully comprehensive, presentation of the subject. There is an absence of author's theories and arguments, quotations and references, which are a feature of other works. This book presents a statement of the subject in concise language, based upon the most recent views and knowledge of the author. The illustrations are excellent.

The book opens with an introductory chapter in which the general subject of deviations from the normal anatomy and physiology is discussed. This chapter contains a description of the signs of death as applied to the whole organism.

The book is thus divided into two parts. Part I treats of general pathology, and Part II, of special pathology. Under the disorders of circulation are described hyperæmia, anæmia, hæmorrhage, œdema, thrombosis, embolism, and metastasis. The chapter on Regressive Processes includes necrosis, atrophy, and the various degenerative changes. Progressive Processes include all of the reparative processes: hypertrophy, inflammations, infectious granulomata, and tumors. Congenital anomalies and deformities and parasites are also treated under Part I. A final chapter in this part is devoted to general diseases from disturbed

general functions, such as cardiac insufficiency, asphyxia, fever, intoxications, and autointoxications.

The part devoted to special diseases takes up systematically the circulatory apparatus; the spleen, lymphatics, and marrow; the respiratory organs; digestive organs; urinary system; nervous system; organs of locomotion; genital organs, and the skin.

This whole arrangement of subjects is an unusual one in text-books on pathology. It makes the book a most valuable adjunct to works on practice of medicine, surgery, and diseases of the special structures. Thus the chapter on the disorders of the circulation needs only to have added the diagnostic signs and treatment to make it a complete chapter on that subject ready for introduction into a text-book on the practice of medicine. This is because the author deals not only with the pathological anatomy, but also with the functional pathology as well,—a feature which makes this work of especial value to the student, who must associate the disorders of structure with those of function.

A particularly valuable chapter is that on regressive processes, giving clear and concise descriptions of the various cell degenerative changes.

The progressive processes are well presented. This chapter deals with the tendency of cells to produce others of their kind, and the stimuli which govern this tendency. During the stage of development there exists the power of cell reproduction to advance to the point of full normal growth. When this has been reached, multiplication of cells ceases, but still the power to replace lost tissue remains. This is the process of repair, and is closely connected with physiological growth. Another progressive process is that of hypertrophy, due in some cases to increased functional activity of an organ, or to unknown internal stimuli. The views of Hansemann are reflected in the author's discussion on metaplasia. He also makes use of Hansemann's term, anaplasia.

The subject of regeneration and repair is presented in a manner that makes this work a valuable adjunct to surgical study.

The process of wound healing is treated in the light of the new knowledge. This is particularly true of inflammation. The author adopts an anatomical description of inflammation rather than a clinical one. The *rubor, tumor, calor, and dolor* of Galen are of value clinically, but in the cadaver only the redness and swelling remain. It is, therefore, difficult to dissect an inflammation. The author treats it as a local defect in the circulatory apparatus. It is finally described as a condition of reaction, "exalted above the physiologically normal, pathologically altered, and called forth by an external irritation."

The descriptions of tumors in general are brief,—too brief to give an adequate picture. This is not altogether the case with the more important neoplasms, carcinoma, and sarcoma, for here the descriptions are fuller; and the value of the work to the student is increased by an abundant clinical description of each variety of malignant growth. We wish particularly to compliment the very excellent work of the artist Krapf in his illustration of glioma.

"The etiology of tumors," the author says, "is one of the darkest points in pathology, for the hypothesis of anaplasia does not explain why in a given case the altered cells develop into a tumor." The author follows the confusing classification of putting endothelium with epithelium, one a mucosa derivative and the other a connective-tissue derivative. Still, he speaks of the epithelium of blood and lymph vessels. The chapter on tumors ends with an appendix giving the differential diagnosis between sarcoma and carcinoma.

The bacteria are given but scant attention. Only a few forms are described; and the general principles of bacteriology are but slightly touched upon.

The chapter on diseases of the blood is good. The pathology of the lungs and of the kidneys is admirably presented; and, indeed, these two subjects show this work to its best advantage. Here the student secures an insight into the pathology of the

structure, and also of the function of these organs, such as few text-books offer.

The description of the diseases of the urinary system, besides giving the pathological anatomy of the various lesions, presents also a great deal of clinical pathology; that is, the lesions are described in such a manner that their anatomy leads up to their symptomatology.

Diseases of bone, diseases of the female genital organs, and diseases of the skin are all well and fully treated.

It is noteworthy that this work goes into the pathology of hernia and intestinal obstructions, subjects which may very properly be considered in text-books of pathology, but which usually have been neglected.

The day is not yet, but will be, when it shall not be necessary for us to have our text-books on pathological anatomy translated out of the German. In this instance the translators have done us a service.

JAMES P. WARBASSE.

DISEASES OF THE SKIN. By JOSEPH GRINDON, PH.B., M.D.
Philadelphia and New York: Lea Brothers & Co.

This volume of three hundred and seventy-seven pages is one of the series of Lea's pocket text-books under the general editorship of Bern B. Gallaudet, M.D.

As a rule, small works upon any special subject are unsatisfactory, for it is almost impossible for the author to do justice to the subject; the book under review is an agreeable exception to the rule.

Dr. Grindon has very skilfully succeeded in making it in truth a text-book which cannot fail to be of benefit to both students and general practitioners.

Any scheme of classification is very wisely omitted; discussion of class is out of place in a book of this sort.

The introduction is a short but comprehensive chapter on

symptomatology; next come a few pages on etiology, followed by three on diagnosis; these last are by far the most valuable in the book, for in a most concise manner all the methods used to make a diagnosis are noted, and many minor points are emphasized that often receive but slight notice in more pretentious works on dermatology.

The author has imbued the work with his personality; it fairly bristles with characteristic remarks, as, for instance, in speaking of rosacea he says, "Alcohol is not the only cause,—of which fact any one having faith in his fellow-man may convince himself by watching the parade of a total abstinence society."

As a rule, the commoner diseases are given the greatest prominence, twenty-four pages being given to eczema; this was undoubtedly done for the benefit of the general practitioner.

The author has not failed to notice all the recent advances in dermatology, even devoting a part of a page to Johnston's paratuberculosis.

The book is liberally illustrated; the pictures are poor, excepting those of syphilis; those for black and whites are unusually fine.

Taking the book as a whole, it stands far ahead of any of the smaller works on dermatology, and the reviewer joins the author's other dermatological confrères in the hope that this is only a synopsis of a larger and more complete text-book.

JAMES M. WINFIELD.

THE DISEASES OF INFANCY AND CHILDHOOD. By L. EMMETT HOLT, M.D., LL.D., Professor of Diseases of Children in the College of Physicians and Surgeons (Columbia University), New York. Second Edition, Revised and Enlarged. 8vo; 1163 pages. New York: D. Appleton and Company, 1902.

This book is the work of a teacher and one trained in hospital wards. It aims to cover the entire field of pædiatrics, but more especially the diseases of infancy and young childhood.

More space than usual has been given to the pathology and description of lesions.

Divided into two parts, the first treats of the hygiene and general care of infants and young children, the growth and development of the body, and the peculiarities of disease in children. The methods of investigation and the differential points of diagnosis are treated entirely from a practical stand-point. In the domain of therapy the author lays down two fundamental principles; first, never to give a dose of medicine without a clear and definite indication, and, second, never to give a nauseous dose when one that is palatable will answer the purpose equally well. Hygiene, surroundings of the patient, the value of good nursing, careful feeding, and judicious stimulation are the key-notes of his treatment. In this field, as in the administration of medicines, most of the recent methods are discussed.

Part II is divided into ten sections; first, the diseases of the newly born; second, those of nutrition, and, lastly, the diseases of the various systems of the body are discussed. A special section is given to the specific infectious diseases. The chapter on diphtheria is especially exhaustive. Nutrition in its broadest sense is considered to be the most important branch of pædiatrics, and the author, believing this, has devoted over one hundred pages to the study of this question. In this chapter the food constituents and the purposes they subserve in nutrition are first taken up. Then the infant's dietary, infant feeding, feeding after the first year, the derangements of nutrition, and, finally, diseases due to faulty nutrition are considered.

The book presents the most advanced teachings on the subject of pædiatrics.

PAUL MONROE PILCHER.

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ORIGINAL MEMOIRS.

SPLENOPEXY FOR WANDERING SPLEEN.

WITH REPORT OF A CASE.

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WANDERING spleen is a rare condition, and the records of operations undertaken for its fixation can still be counted on the fingers. The considerable enlargement of the organ that is usually coexisting, and the free hæmorrhage which results if sutures are made to penetrate the parenchyma, have driven the surgeon to choose extirpation rather than attempt fixation in most of the cases that have been operated upon. Nevertheless, although the mortality of splenectomy for floating spleen has fallen during the last decade to something less than 10 per cent., this operation can scarcely be regarded as ideal treatment unless it is first demonstrated that fixation of the organ is impracticable.

On looking through the literature of the subject, I have only been able to find records of eight cases in which splenopexy has been performed for floating spleen. To these I would now add the following case.

E. G., a married woman, aged thirty years, was admitted into the Bradford Royal Infirmary under Dr. Campbell, who transferred her to the surgical wards under my care on November 20,

1901. She stated that she had been subject to bilious attacks since she was fourteen years of age. Up to her marriage at the age of twenty-three she had no other illness of note. She has had four children. The first labor was difficult and protracted, the child being stillborn. She has given birth to three children subsequently, labor in each case being normal. She has never been quite well, however, since the first confinement. After her accouchement she felt a constant dragging pain in her left side whenever she walked about. This has grown steadily worse for the past seven years. The pain has not been very acute in character, but "it made her sick," and she has been debarred from active life. Latterly, she has also had attacks of acute abdominal pain coming on suddenly, usually after some rapid movement, such as rising up or sitting down. During these attacks she is very faint, and a large, tender swelling can be felt in her abdomen. Relief is obtained by lying down. Since these attacks first called her attention to it, she can now always feel a large lump in the abdomen "which moves about."

Condition on Admission.—A healthy looking woman, rather thin, with bright eyes and rosy complexion. The abdominal wall is flaccid and shows well-marked lineæ albicantes. A firm, elongated tumor can be felt in the left hypochondrium, projecting below the costal margin and reaching nearly to the middle line at the umbilicus. It moves with respiration, and can be displaced by palpation in various directions. When the patient is standing it can be pushed almost into the right iliac fossa. The tumor is obviously an enlarged spleen; the firm edge, with a well-marked notch on the anterior border, being very evident. It is slightly tender on manipulation. There is no sign of any organic disease in the other organs of the body. The urine contains no albumen or sugar. The blood count gives no evidence of any abnormal condition. Diagnosis, floating spleen with secondary enlargement.

Operation.—On November 22, 1901, ether was administered, and the abdomen opened by an incision four inches long at the outer border of the left rectus abdominis. The lower pole of the spleen was exposed by this incision, and the whole organ was then delivered through it without much difficulty. It was seven and a half inches long and three and a half inches wide at its centre. Except for its size, it was to all appearances a normal spleen. At this stage it was evident that splenectomy could be easily accom-

plished. The pedicle was so long that the delivery through the incision had scarcely tightened it, and the arrangement of the vessels was such as to allow of easy separate ligation. Whilst considering the advisability of removal, however, it was noticed that the notch on the anterior border was only two to three inches from the lower extremity of the spleen, and the depth of the notch was such that the lower pole of the spleen was only connected to the rest of the organ by a comparatively narrow isthmus. This arrangement at once suggested an easy means of fixing the organ. The main body of the spleen was therefore replaced in the abdomen after rendering the parietal peritoneum raw in the splenic fossa in order to excite adhesions. Then, whilst the lower pole was held in the wound, the edges of the peritoneum were drawn tight by a purse-string suture until they closely gripped the narrow isthmus in the notch. The abdominal aponeurosis was next sutured in a similar manner until it grasped the isthmus in the notch sufficiently tightly to produce marked congestion of the now isolated lower pole. The left rectus muscle was next drawn outward somewhat, so as to overlap the projecting pole of the spleen as much as possible, and the skin incision sutured. After closing the skin incision, a prominent lump the size of half an orange remained.

There was no appreciable shock during or after the operation. The pulse quickened on delivering the spleen through the incision, but not to any alarming extent. For the first twenty-four hours after operation pain was severe, and required morphine for its relief. Two days later a small opening was made through the skin and a drainage tube inserted, as fluid was collecting in the dead space beneath the rectus muscle round the projecting spleen. After this, recovery was uneventful. At the end of a fortnight the lump in the abdominal wall was harder and had slightly diminished in size. The patient returned home at the end of a month. Three months after the operation there was a hard, flattened swelling to be felt in the abdominal wall. It was painless, and the spleen within the abdomen was firmly attached to it. So far as it was possible to determine, the spleen had shrunk, but the diminution in size was not very great. It could not be displaced by palpation nor by any change of posture. The patient was entirely relieved of her symptoms, and stated that she could now undertake her household duties or any active exertion. This satisfactory result has now been maintained for twelve months.

The means that have hitherto been adopted for obtaining fixation of a floating spleen are, broadly speaking, three in number, namely, the excitation of adhesions by tamponade, the formation of a pocket in the parietal peritoneum in which the lower end of the spleen is placed, and the use of sutures. To these may be added the method of Sykoff¹ which has been performed experimentally on dogs. Acting on the suggestion of Lewschin, Sykoff suspended the spleen in a catgut net. This method has not been attempted in man, where the conditions to be met, especially when the spleen is enlarged, are so totally different that the procedure seems scarcely likely to meet with success.

The origin of the operation of splenopexy is usually credited to Rydygier, but the first publication of two cases seems to have been made by Kouwer² in 1895, who opened the abdomen by a lumbar incision, fixing the spleen in it by means of tamponade. In his first case the result was good, but in the second the tamponade had to be removed on account of symptoms of ileus appearing.

In the same year Rydygier³ published a case in which he fixed the lower end of the spleen in a pocket in the parietal peritoneum. He opened the abdomen in the middle line and detached sufficient of the peritoneum from the left abdominal wall to hold half the spleen. Three months later the result remained satisfactory.

In the same year Pflücker⁴ also reported a case operated upon by Bardenheuer. Here the spleen was "dislocated" through a small peritoneal opening in the left flank and fixed by a silk suture to the tenth rib.

In 1896, Giordano⁵ reported a case. The spleen, which was four times its natural size, was fixed with sutures "high up between the diaphragm and abdominal wall" (?). The result was satisfactory.

In 1897, Greiffenhagen⁶ reported a case in which he secured fixation by passing two silk sutures through the parenchyma of the spleen and the muscles of the abdominal wall.

Fierce bleeding took place, which was controlled with difficulty. Seven months later the result was good.

In 1898, Franke⁷ published a case in which he placed the lower pole of the spleen in a pocket in the parietal peritoneum and fixed the pedicle by sutures to the abdominal wall.

In 1901, J. C. Warren⁸ reported a case operated upon by Balch. The spleen, which was very large, was extensively adherent to the pelvic brim. There had been previous attacks of peritonitis. After tedious stripping of adhesions, the spleen was pushed "as high up in the abdomen as possible." No suturing was done, but the subsequent reformation of adhesions was relied upon to secure fixation. The result was good.

I have included this case operated upon by Balch, although it is doubtful if it should be reckoned as a case of splenopexy. The subsequent fixation of the organ appears to have depended entirely upon the reformation of adhesions, and not upon any special operative technique designed for the purpose.

The method of fixation adopted in my own case differs from any of those previously resorted to in the principle of making use of the notch in the spleen as a means of fixation. When such a method is feasible, it undoubtedly secures a safe and easy anchorage of the organ. It is evident, however, that such a method cannot have a universal application, since the notch may be absent or so placed as to be useless for the purpose. Further operative experience alone can decide how often this method is applicable.

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URETHROPLASTY.

REMARKS ON THE REPAIR OF DEFECTS OF THE MALE URETHRA, WITH REPORT OF
TWO CASES.¹

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THE ideal aim of all plastic surgery is the replacement of diseased or defective parts by tissues whose structure and function are similar to the healthy ones. Only exceptionally is a full realization of this ideal possible, the final result failing of it in one or the other condition.

The comparative merits of plastic operations are judged by the standard of the ideal, and in their use we should select such as most nearly satisfy its conditions. Only when the necessities of the situation demand is resort made to those methods that depart mostly from it.

In the male urethra, as in other parts, numerous methods for the repair of defects have been devised. To an endeavor to fix some broad indications for the employment of the special methods this contribution is devoted.

The male urethra is, roughly speaking, made up of three coats,—the mucosa, the submucosa, and the muscularis. It is surrounded in its anterior part by the cavernous body, and in its beginning by the prostate gland. The cavernous body is so intimately connected with the walls of the anterior portion of the canal that, for practical purposes, it should be considered as an integral part of it.

The submucosa, especially of the penile portion, contains a marked abundance of elastic fibres, which permits to this organ considerable distractibility; a most important attribute from the stand-point of plastic operations. In virtue of this

¹ Read before the Section of Genito-Urinary Diseases of the New York Academy of Medicine, December, 1902.

elasticity, the urethra can be stretched so as to supply a defect in its continuity between two and three centimetres. Naturally the penile portion enjoys a greater elasticity than do the fixed membranous and prostatic parts.

The urethra possesses another attribute which is of importance for plastic surgery upon it, viz., its power of almost complete regeneration from a stump which has been left behind. The excellent experiments of Ingianni (*Centralblatt für Chirurgie*, 1899, No. 6) upon the regenerative power of the urethra prove

(1) That the regeneration of smaller or larger portions of the urethra can be experimentally attained.

(2) That the parts of the urethra which regenerate are the mucosa and cavernous body; the muscularis takes no part in it.

(3) That the regeneration takes place from the stumps of the urethra.

(4) That a small stump of the urethra when it is implanted into one end of an artificial canal made under the skin will grow and gradually line the interior of the entire canal. In this way a new canal can be constructed which in structure and function approaches the normal, and which can replace the latter. Such a newly formed canal lacks only a muscularis.

These two attributes of the urethra, viz., its great elasticity and its power of almost complete regeneration from its stump, have an important practical bearing in the plastic work upon it.

Preliminary Considerations.—The successful issue of any form of urethral plastic operation is greatly dependent upon a healthy, sweet condition of the urine, a tolerance of the bladder and urethra for a permanent catheter, and strictest attention to asepsis and antisepsis. The internal administration of urotropine in doses of ten grains twice daily, or of one of the other urinary antiseptics, together with proper treatment of any pre-existing urethral and vesical inflammations, will serve to render the urine sweet and clear. The main causes of vesical and urethral intolerance to a permanent catheter are inflammatory states of the urethra and bladder and foul urine. The writer

has rarely seen intolerance when the urine was normal and the vesical and urethral mucosa in a healthy state. Irritable patients will complain of the pain and smarting from the presence of a foreign body in the canal, but such symptoms are readily relieved by morphine and bromides.

Types of plastic operations and indications for their application.

A. The elasticity of the urethral walls will at once suggest the method of mobilization of the stumps, stretching them until the ends meet, and uniting them in this position by end-to-end suture. By this method the defective parts are replaced with tissues of exactly similar structure and function, and thereby the ideal aim is achieved. It would therefore be the method of choice, with the following limitations:

(1) The defect must not be too large; never exceed three centimetres; usually two centimetres is the limit to which the ends of the urethra can be distracted.

(2) The urethral stumps must be mobilizable; not too firmly embedded in cicatricial tissue.

(3) The urethral stumps must not have been rendered brittle and inelastic by inflammatory processes.

Partial defects of one wall of the urethra would rarely be repaired by this method; for other types of operation are attended with less risks and give equally good results. The method finds its best application in complete or almost complete defects, not exceeding two to two and one-half centimetres in extent.

When union has occurred, which usually happens in well selected cases, the structural and functional results are perfect.

The dangers to be feared are sloughing of the stump ends from too much tension. Such excessive tension arises either from over-distracted or from incomplete immobilization. Infection either from urinary extravasation between the united ends, or as a direct result of the operation, does not jeopardize the final issue unless it is of a severe type; urinary fistulæ resulting from such infection tend to close spontaneously.

In the performance of this operation, the parts are first

thoroughly freshened and cleaned. The urethral stumps are then well mobilized for several inches on each side of the defect and brought together. The ends are held in apposition by a row of fine catgut sutures, passed in Lembert fashion, and going through all the coats but the mucosa. The perineal soft parts are then united in close apposition over the newly formed canal by two rows of buried catgut sutures; the skin is united by fine silk. A permanent catheter is left in the urethra for seven days.

B. Restoration of defects, partial or complete, by regeneration from its ends (Guyon's operation). (*Gaz. Hebd. de Médecine et de Chirurgie*, No. 20, 1892.)

As such regeneration results in the formation of new walls, differing from the normal only in the absence of a muscular layer, the result approaches very nearly to the ideal. The lack of a muscular tunic would theoretically favor incomplete contraction of the walls of the canal with retention of a few drops of urine within the lumen and resulting decomposition and chronic urethritis. Practically this has not been noticed.

Hampered by none of the limitations of the foregoing method, and attended by practically no dangers of sloughing of the urethral ends, this method finds a much wider range of applicability. There are few contraindications to its employment. Chief of these are (*a*) extensive loss of substance of the soft parts overlying the urethra, or (*b*) extensive cicatrization of these tissues. Whereas the former method is chiefly applicable to small, complete, or nearly complete defects, this method may be employed equally well in complete or partial and small or very extensive ones. In its performance it is simple. The perineal tissues surrounding the defect are first thoroughly freshened and cleansed, and the ends of the urethral stumps freed from their surroundings. As large a soft catheter as the urethral canal will comfortably accommodate is then passed through the two separated parts of the canal into the bladder. Over this catheter the perineal tissues are approximated by two rows of buried fine chromicized catgut sutures, and the skin united with fine silk. The catheter remains *in*

situ for ten days, by which time regeneration has so far occurred as to insure success. After the catheter is removed, the patient is permitted to void his urine spontaneously. As in some patients the catheter is not well borne, or at all tolerated for ten days, it has been proposed to drain the bladder through a perineal opening behind the affected portion of the urethral canal. If the urine is sweet before operation, and the patient is kept well under morphine and bromides, it seems to the writer that very few instances of non-toleration for the catheter will be encountered. In the two cases of the writer, one of which was a child with clear urine, the other an adult with foul urine, no difficulties were encountered from this source. The milder grades of infection of the perineal wound are of no material consequence to the ultimate good result, and, as in the foregoing method, the perineal fistulæ that follow such infection close spontaneously.

C. Formation of a new canal by grafting skin or mucous membrane either from the immediate vicinity or from other parts of the body upon the site of the defect, and then uniting such grafts to the proximal and distal stumps of the urethral walls. This method has but a limited range of applicability.

The walls of the canal thus made differ radically from the normal ones, as they possess neither urethral mucosa, muscularis, cavernous tissue, or abundance of elastic tissue. Without the latter, erection of the penis is materially interfered with. A canal so constituted serves only as a channel to transmit the passage of urine and semen.

The operation is necessarily done in several sittings, and its successful result is consequently more uncertain than in the previous methods.

This type of plastic operation will find its application only where either of the others cannot be employed. Its procedure necessarily varies with the method of grafting that is employed. The underlying principle consists in grafting skin or mucous membrane into the defect between the urethral stumps, and when such graft has become adherent uniting it at either end to the urethra. The graft is then closed circularly over

a catheter passed into the bladder, and the overlying perineal soft parts approximated by several rows of buried sutures.

End Results of Plastic Operations.—Whatever the method employed, there seems to be but little tendency in the newly formed portion of the canal to contraction. In the writer's two cases, one of whom has been under observation for two years, there has been no contraction. It has been noticed in the child that the newly formed portion of the canal does not increase in caliber with the same rapidity as the other part. Thus, whereas at the time of operation a No. 10 French bougie was the largest size the anterior urethra could accommodate, a No. 12 French is easily passed to-day, but only a No. 11 French will pass through the perineal urethra.

The following two cases, operated upon by the writer during the summer of 1900, illustrate very well the value of Guyon's operation,—the reconstruction of the urethra by regeneration from its stumps.

CASE I.—S. F., ten years old, was admitted to the surgical service of Dr. Gerster at Mt. Sinai Hospital on August 14, 1900. Three days before he had fallen astride a beam, injuring his perineum. He was unable to urinate after the injury, catheterization being necessary. The next day a discolored swelling appeared in the perineum. This rapidly increased in size, spreading over the entire perineum, scrotum, penis, and pubic region. The following day he had several chills and high fever. The urine had to be withdrawn by catheter since the time of the accident.

On admission, the well-nourished, healthy boy presented the following physical signs. The perineum, scrotum, and penis were occupied by an œdematous, ecchymotic, fluctuating swelling which was gangrenous in patches. The ecchymosis extended well downward on the inner aspect of the thighs. The bladder was distended, reaching up to near the umbilicus. A catheter passed into the meatus, entered into a pouch in the perineum, from which several ounces of turbid decomposing urine were withdrawn. It was impossible to pass the catheter beyond the bulbous urethra. The child stated that his physician had introduced the catheter only to this point. Temperature, 104° F.; pulse, 120.

The child had sustained from the injury a rupture of the perineal urethra. He had voided his urine for three days through this rupture into the cellular tissue of the perineum, from which place it had been withdrawn by catheter. The urinary extravasation had spread over the scrotum, penis, and abdomen, and the perineal tissues had already become gangrenous.

Immediate perineal section was proceeded with. The deep perineal structures were found to be gangrenous and infiltrated with decomposed purulent urine. A tunnelled sound passed into the urethra through the meatus emerged into the perineum through a large rent in the bulbomembranous portion. The walls of the latter were gangrenous. After some search the distal end of the proximal portion of the lacerated urethra was found, and a catheter passed into the bladder, withdrawing clear urine. The catheter was left *in situ*. Numerous cutaneous incisions were then made in the perineum, scrotum, and pubic regions to let out the infiltrated urine. All the wounds were packed and a wet dressing applied.

The boy reacted well from the operation. The fever at once subsided. After several days the gangrenous tissues commenced to separate. Drainage of the bladder was discontinued on the seventh day, the boy voiding his urine through the perineum thereafter. A sound was daily passed through the anterior urethra and through the perineum into the bladder. On September 5 the wound was entirely covered by granulations. Examination showed the urethral ends to be separated one and one-half inches. There appeared to be no connection between the proximal and distal ends.

September 7. Urethroplasty ("Guyon").—The boy in the lithotomy position. The urethral ends were dissected free from the neighboring tissues. The defect in the urethra was found not to be a complete one, as a strip of mucous membrane one-eighth of an inch wide along the superior wall connected the two ends. A No. 5 soft rubber catheter was passed through the anterior urethra into the posterior urethra and bladder. At the site of the defect, the adjacent perineal soft parts, which had been thoroughly freshened, were closely united over the catheter by fine catgut sutures passed Lembert fashion. Over this the overlying perineal tissues were sutured with two rows of buried catgut sutures, and two final silkworm-gut sutures were passed

through the entire perineal tissues, to relieve tension. Catheter left *in situ* and a dry aseptic dressing applied. The bowels were ordered to be kept constipated for one week.

September 11. During the first four days after operation the boy felt very well; only moderate temperature elevations. During the night of September 11 he complained of great pain in the urethra. Examination showed that the catheter had been extruded about two inches. The house surgeon was unable to reinsert the catheter, and, as the child was in pain from retention of urine, he was given a hot enema. In expelling the enema he passed urine through the perineal wound. The next morning I was able to easily pass a No. 5 Mercier catheter into the bladder through the urethra. This was again left *in situ* and strapped in position.

September 14. Bowels moved by enema. Perineal stitches removed, and a new catheter inserted per urethram into the bladder.

16. Catheter removed: the patient urinated voluntarily through the meatus. Slight leakage through a small perineal fistula. Catheter left out.

18. The boy passed most of the urine through the perineal fistula. Permanent catheter replaced until the fistula should contract.

26. Catheter left out. Only a few drops of urine are passed through the perineum. Bougies Nos. 8 and 10 are passed daily.

April 1, 1902. A No. 11 French bougie passed very easily. Urine clear, stream of fairly good force. No flexion of penis. Still has a little difficulty in holding his urine, though he is much better in this respect than he was.

CASE II.—An adult male, A. K., admitted August 29, 1900. He had suffered with a urethral stricture for three years. The stenosis had become progressively worse, and for the past few months urination had been very difficult. During the latter period he had often passed considerable blood in the urine. For ten days prior to his admission, he had been able to pass only very small quantities of urine at a time, and this with very much straining. He also began to have pain in the perineum, pain with defecation, and a swelling appeared in the perineum. The pain and swelling gradually increased, and at the time of his admission to the hospital urination had become impossible. The patient had some fever, but no chills.

On admission, the poorly nourished man of forty-five years presented a red, painful, fluctuating swelling in the right ischio-rectal region, extending forward to the scrotum.

The scrotum and penis were very oedematous. A catheter introduced into the urethra could not be passed beyond the bulbo-membranous junction. From this space a few ounces of decomposing purulent urine were evacuated. The bladder was distended to the umbilicus. Temperature, 102° F.

Immediate perineal section was proceeded with, a metal catheter being passed into the urethra, down to the bulb, as a guide. The perineal tissues were found to be infiltrated with decomposed, purulent urine, and the end of the catheter projected into the perineum through the gangrenous and necrotic walls of the urethra. The superior wall of the urethra was intact, and by following along it, a probe was introduced into the bladder. Alongside of the probe a catheter was passed and the bladder evacuated. The catheter was left *in situ*. The swelling in the ischio-rectal space was incised and drained of several ounces of purulent decomposed urine.

Drainage of the bladder was maintained for twelve days. After removal of the catheter all the urine was voided through the perineum. The necrotic tissue was entirely separated by the twelfth day, and the wound was nicely granulating. Examination then revealed a defect of three-fourths of an inch in the floor and lateral walls of the perineal urethra. A false passage just anterior to this defect was divided. Eighteen days later, all of the urine was still voided through the perineal opening. There was no tendency to spontaneous closure of the urethral defect.

September 28. Perineal wound freshened. The urethra, which was deficient for three-fourths of an inch in its inferior and lateral walls, was dissected out, and a soft rubber catheter, No. 20 French, passed through the entire length of the canal into the bladder. The tissues adjacent to the deficient urethra were united over the catheter by two rows of buried chromicized catgut sutures passed Lembert fashion. The skin was closed with silk.

The catheter was well tolerated and remained *in situ* for one week. At its removal at the end of seven days the patient urinated voluntarily through the meatus, with absolutely no perineal leakage. Primary union of the perineal soft tissues. The catheter

was replaced for two days more. It was then permanently removed. All urine was passed per meatus. Perineum sound. No pain or difficulty in urination. Sounds passed daily, 20 to 25 French. Discharged cured, October 14.

At the end of nine months, No. 25 French sound passed easily. The patient still has a marked cystitis. No difficulty in urination. No leakage of urine. Had not been sounded for six months.

Remarks.—This patient had suffered a rupture of the urethra during straining at urination. The urine escaping through this rupture infiltrated the right side of the perineum, and the suppuration had then extended backward into the ischiorectal space. The walls of the perineal urethra had undergone gangrene from this suppurating process.

CARCINOMATOUS CHANGES IN AN AREA OF CHRONIC ULCERATION, OR MARJOLIN'S ULCER.¹

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DURING the past year I have seen two cases of this rare condition. The first case was a woman sixty-eight years of age, who was a patient in the Surgical Ward of the Philadelphia Hospital. For many years she had suffered from what was regarded as a varicose ulcer of the leg. During the last six months the discharge had become very foul; the edges of the ulcer had become thick, everted, hard, and rose-colored; and a section of the margin of the ulcer shows that it was epitheliomatous. The patient declined amputation.

The second patient was a woman fifty years of age, and was seen in the Jefferson College Hospital. Her father died at the age of 105; her mother, at eighty-seven years. While pregnant with the last child, fifteen years ago, she developed varicose veins of both legs; from the left leg, in the region which now is the seat of the ulcer, there was a considerable hæmorrhage, and a sore. The latter healed after her delivery, and remained well until two years ago, when it again broke out. It healed up in a few weeks, remained well for a month or so, and then broke out again; since that time it has remained open. On two occasions she went to hospitals and had it burned with caustic. Eighteen months ago it was the size of a ten-cent piece; now it is seven inches in width and six inches in length. She has considerable pain in the bone of the leg, which is much worse at night. The ulcer at some spots has undermined edges, and is elevated at certain places on the margin; its border is hard and dense, and sections which have been removed for examination show it to be an epithelioma. The patient declined to submit to amputation.

¹ Read before the Philadelphia Academy of Surgery, November 3, 1902.

The two cases cited above are instances of chronic ulcers of the cutaneous surface which became carcinomatous. The characterization of this condition as Marjolin's ulcer I think to be proper, because it was first carefully studied and accurately described by Professor Marjolin, of Paris, over fifty years ago.

It is a very ancient and well-demonstrated belief that cancer may arise, and, in fact, is rather apt to arise, in an area of chronic inflammation; for instance, on the lip of a pipe-smoker, on the tongue of a lather or carpet-layer—who holds nails or tacks in his mouth—on the scrotum of chimney-sweeps and paraffin-workers, in a gall-bladder containing gall-stones, on the skin of the nose where the bridge of an eye-glass or of a pair of spectacles has rested, on the tongue where the sharp edge of a tooth has been in contact, and in numberless other locations. It has been demonstrated that a laceration of the cervix uteri or an ulcer of the tongue is likely to become cancerous, and that an ulcer of the stomach occasionally becomes so.

The question of the relationship between gastric ulcer and gastric cancer is very much disputed. Strümpell and others are positive that there is a causal relation between them; and Schmidt has pointed out that a cell-degeneration, identical or of similar character, is to be found about each of these lesions.

On the cutaneous surface of the body, it is a rare occurrence for an innocent lesion to become cancerous, although occasionally this does take place. There is, of course, a certain relation between innocent and malignant epithelial growths, in the fact that in both there is an excessive growth of epithelium. We find this excessive epithelial proliferation in warts, in *Molluscum contagiosum*, and in some syphilitic and tubercular lesions; but, although in innocent conditions there is epithelial overgrowth, there is never unlimited and unrestrained growth, and the multiplying cells grow outward, as a rule; and even if they grow inward, they do not infiltrate tissues, and do not abolish the normally clear division which exists between derm and epiderm.

We have seen an area of chronic eczema on the left hand

of a locomotive engineer become cancerous. It is this hand that habitually rests upon the throttle-valve; and the throttle-valve is often warm, or even hot. We have seen cancer arise from a wart, from the scar of a burn, from the margins of an anal fistula. Nevi and moles occasionally become cancerous; but, as a rule, the malignant growth which springs from either one of these is sarcoma rather than carcinoma. We have never seen a carcinoma arise from a corn, although it has been alleged that it sometimes does so. That it occasionally arises from an old area of lupus, a syphilitic ulcer, or an ordinary chronic ulcer of the leg is undoubted.

When a cancer arises from an ulcer, it is not to be supposed that the connective tissue of the ulcer has been converted into epithelium. The proliferating epithelium of a cancer must spring from pre-existing epithelium; hence, it sometimes comes from epithelial elements, such as sweat-glands or hair-follicles, that lie undestroyed among the granulations of the ulcer, or, what is more common, from the edges of the ulcer itself. In the vast majority of instances, a malignant growth that arises in an area of ulceration on the cutaneous surface begins at some point on the margin of the ulcer.

The fact that malignant growth can follow chronic irritation is not proof positive that the irritation is its direct cause. A great many hold that in such a case the ulcer is not directly converted into a cancer, but that the chronic irritation in the ulcerated area simply allows of the admission and favors the destructive action of some cancer germ.

It is certainly not proved, at the present time, that cancer is due to a germ, although many of the ablest students and observers are of the opinion that it is. There is no theory as to the cause that is really capable of explaining all the phenomena of cancer. Beside the fact that regions that are irritated or injured are particularly prone to develop cancer, the parasitic theory has gained support from the observation that metastases take place; and that it may be possible to inoculate the growth into the lower animals, or that an accidental inoculation may take place at another part of the body of the indi-

vidual who is suffering from the disease. But there is considerable doubt as to the real cancerous nature of many of the tumors that have been transplanted from one animal to another; and, further, a great many different parasites have been alleged to cause cancer. Many supposed parasites are, however, really cell-degenerations; and, whereas yeasts and blastomycetes may exist in a carcinoma, it is very doubtful whether they are causative.

Gaylord and others strongly maintain that protozoa are the cause, but their experiments seem to have failed to demonstrate absolutely that epithelial cells were not transferred. There is no doubt that epithelial cells can be transplanted. We carry this process out deliberately in skin-grafting; and yet we do not assume that a parasite exists because the transplanted cells grow. It is equally possible to transplant the embryonal cells of cancer; and if they take root and grow, this is no proof that parasites are present.

The existence of metastases seems, at first glance, to be strongly suggestive of a parasitic influence. These secondary tumors are, however, not due to the proliferation of lymphatic structure in that region, as would be the case in an ordinary infection; but they are the result of the transfer of epithelial cells from the primary focus, the deposition of these cells in the lymphatic tissue, and their multiplication in this tissue. As Nicholas Senn says, a parasitic origin is improbable from histology and histogenesis; and the secondary tumors are not due to the growth of pre-existing lymphatic structures.

In view of the possibility that an ulcer of the cutaneous surface may become malignant, it becomes highly important that every chronic ulcer should be subjected to a thorough study for the purpose of making a careful diagnosis. As previously stated, in any chronic ulcer malignant change is most apt to appear at the edges, and persistent and increasing induration should excite suspicion. Of course, in the ordinary indolent ulcer there is a great mass of scar tissue, which often fastens the ulcer to the bone; but this mass of tissue does not have a local beginning, as it seems to appear and advance equally at

all parts of the edges, and also at the base of the ulcer. Then, again, the edges, though thick, are often smooth and are usually free from tenderness. The most chronic form of indolent ulcer is known as the callous ulcer; and this ulcer, unlike a malignant growth, is distinctly sunk below the cutaneous level. Its entire border is hard and knobby. It is not tender, and the appearance of the ulcer varies scarcely at all from week to week or from month to month.

When a carcinomatous change takes place in a chronic ulcer, induration usually begins at a portion of the margin and spreads slowly, progressively, and inexorably; although, even after it has existed for a considerable time, we may find but one-third or one-half of the margin of the ulcer to be malignant, the balance of its edge being non-malignant. In fact, it is extremely rarely that the entire margin of a large ulcer is converted into malignant disease; it requires a long time to effect this.

An important fact to remember is that, whereas very chronic, simple ulcers are rarely tender or painful, in malignant disease there is both induration and pain. This pain, as Paget long ago pointed out, is of a hot, scalding, or darting character.

The discharge of a chronic ulcer which becomes cancerous is increased in amount and becomes ichorous, and marked bleeding may occur. A foul, and even stinking, discharge, containing visible masses of destroyed tissue, is a usual feature.

Again, as Paget has likewise shown us, we find, here and there, on the margins of such a malignant growth, spots where apparent healing has occurred; but this is not due to the healing of actual cancerous tissue, but to the fact that non-cancerous regions have healed or that portions of the malignant growth have sloughed out, leaving a non-cancerous bed which will heal.

When the growth has attained a considerable size, we shall find that its base and margins are densely indurated; that the patient suffers from shooting or burning pain in the ulcerated area; that the floor is uneven, and frequently of a warty appearance or like a cauliflower; and that there is a profuse, stinking, and bloody discharge.

At some time or other the anatomically related lymph glands are bound to enlarge; although this seems, as a rule, to be late, probably because the previous induration has blocked up the lymph channels.

The most difficult case in which to make a diagnosis is one in which there has been great pre-existing induration of a chronic ulcer, and the knobby induration of the cancerous change is not appreciated and differentiated for a considerable time. In every doubtful case of chronic ulcer, portions should be removed from the margins and be studied by a skilled pathologist.

And right here a caution should be put forth. In two cases a pathologist reported carcinoma of the tongue, but recovery followed the administration of antisyphilitic treatment. In one case of ulcer of the leg a pathologist declared the condition to be cancerous, but Dr. Hearn and I were doubtful, and specific treatment effected a cure. Such mistakes sometimes arise because of the common belief that embryonal or atypical epithelial cells justify always a diagnosis of cancer, and yet healing sometimes occurs even when such a finding has been made.

What really does justify a declaration that carcinoma is present is the unrestrained multiplication of epithelium as shown by the infiltration of the apparently sound tissue at the margin of the growth. The finding of the pathologist is of the greatest value if proper material is sent to him to study. When the surgeon removes a bit of a growth for microscopic investigation, it should be large enough to make many sections, and should include not only a portion of the obvious growth, but also a portion of the adjacent and apparently healthy tissue.

If a carefully made clinical diagnosis is not in accord with the microscopist's diagnosis of carcinoma, no such radical operation as amputation should be performed until the situation has become clear and the diagnosis positive.

When a positive diagnosis of cancer arising in an ulcer of an extremity is made, there is only one proper operative

treatment; *i. e.*, amputation well above it, and the removal of anatomically related glands, even if another incision has to be made to accomplish this. For instance, if dealing with an ulcer in the middle of the leg, we should amputate well above the knee, and should then make an incision into the groin that will permit us to remove the inguinal and femoral glands. That a condition such as this is very rare is shown by the fact that the elder Gross, in more than a half-century of surgical experience, saw only three cases of ulcer of the leg that required amputation.

Marjolin's ulcer may be greatly benefited by the X-ray; hence, before considering amputation try this agent, if glands are not obviously enlarged. The late period at which glandular enlargement is apt to occur makes this plan hopeful.

In an advanced case in which operation is refused, the X-ray may still be of service in lessening the rapidity of the growth, checking discharge and hæmorrhage, and subduing pain.

A CASE OF DISLOCATION OF THE HIP IN ACUTE RHEUMATISM.

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A BOY, ten years of age, was seen by me, November 24, 1899, on account of an attack of acute articular rheumatism which then affected chiefly the left ankle. By the 26th it had involved the knee and hip of the same side. A careful measurement of the trochanter in its relation to the pelvis and of the length of the limb was made on this day, because of the unilateral involvement, but all measurements were normal. Sodium salicylate was given in vigorous dosage.

On the 29th, the case was seen at my request by Dr. C. G. Hickey, who repeated the measurements, as we both thought that the severe pain in the hip possibly came from some trouble of a more serious nature than the articular rheumatism. The joint was exactly like the opposite one save for redness, tenderness, pain, and slight swelling.

After a month of sickness, during which shoulders, elbows, wrists, and finger-joints were involved, the patient improved as to his rheumatism, but developed two small bedsores over the sacrum. Because of these, he began to assume a right lateral decubitus. His rheumatism was so much better that I did not see him during January, 1900, until the 14th, when I was sent for, because his hip appeared to the parents to be out of place. The left hip was so evidently dislocated that I sent the boy to the service of Dr. Rogers in the Arapahoe County Hospital. He was in fair condition otherwise, and practically free from rheumatic pains and from fever.

Dr. Rogers, on examination, pronounced the condition to be a well-marked case of dorsal dislocation.

On January 17 he anæsthetized him, and reduced the hip by manipulation. No great difficulties presented, but the head of the femur, on finding its place, did not sink into the acetabulum as it would in a recent dislocation, but seemed to lie superficially,

as if the socket were filled up with exudates. The boy was placed in bed with a Buck's extension apparatus, and the leg kept in position for about three weeks before allowing him to move it, lest a redislocation should occur. He was discharged from the hospital with the bone apparently firm in its normal position, but with very restricted motion at the joint.

On April 9, 1902, Dr. Rogers carefully examined the case and found the following condition: Slight, almost unnoticeable, limp in ordinary walking; considerable thickening apparent about the head of the bone; rotation limited; could only evert the leg to an angle of about forty degrees from perpendicular; left thigh flexes only to right angle with trunk; adduction of left leg limited to an angle of thirty degrees (right, sixty degrees); on turning on the face, posterior motion only about half that of the right hip, and difference in the appearance much more marked, there being much protrusion over the left trochanter and an absence of the gluteal fold.

Within these limits movement was free and easy. On measurement, the left leg was found one-third of an inch shorter than the right; circumference of left centre thigh, fourteen and one-half inches; right, sixteen inches; knee, left, twelve and seven-eighths inches; right, thirteen and one-fourth inches; calf, eleven and three-fourths of an inch; right, twelve inches; measurement from medial line to line of protuberance of left trochanter, one-half of an inch more than same on right.

The boy seemed to suffer very little inconvenience from this restriction of motion, and the slight limp seemed due more to muscular weakness than to the defect in the joint.

INSTRUMENT TO PROTECT THE BRAIN WHILE DOING CRANIOTOMY WITH GIGLI SAW.

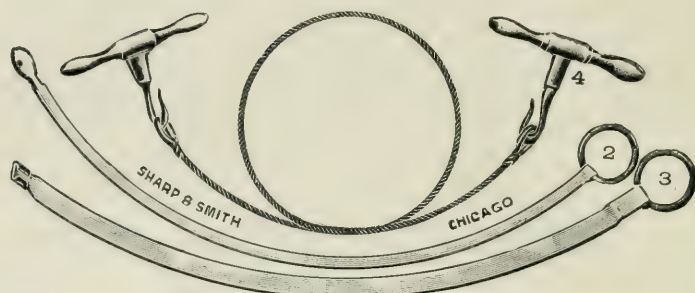
BY FREDERICK C. SCHAEFER, M.D.,

OF CHICAGO,

Professor of Surgery in the Post-Graduate School and Hospital; Gynæcologist to St. Elizabeth's Hospital; Chief Surgeon to St. Hedwig's Hospital.

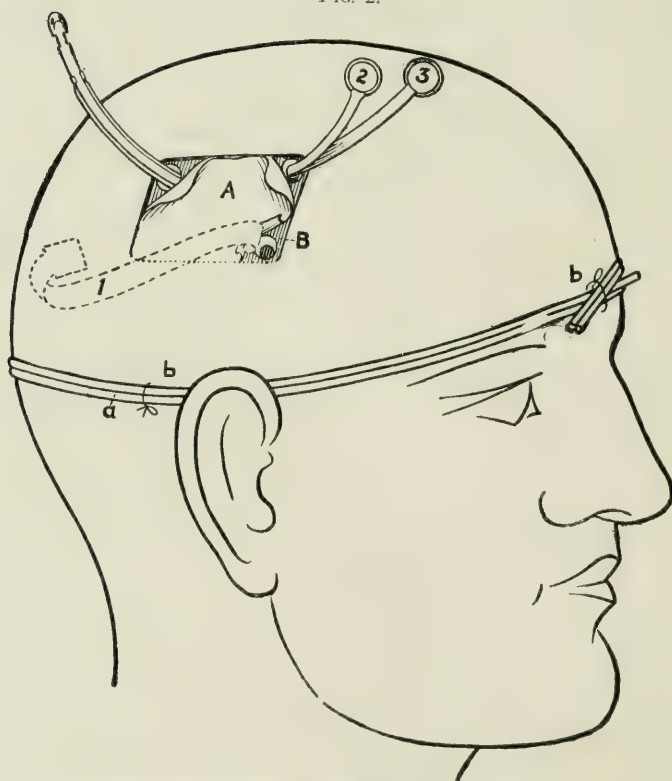
EVERY surgeon who has used the Gigli saw in opening the skull is cognizant of the fact that there is great danger of sawing through the dura mater, arachnoid, and pia mater into the brain tissue. The longer the cut the greater the danger on account of the convexity of the brain surface. The saw forms the string of a bow, the latter being represented by the arched skull bone. It is practically impossible to make an incision much over three centimetres long without damaging the brain or its coverings. Having known this accident to occur in the hands of experienced operators, I concluded to make an effort to overcome this difficulty, and devised a "brain protector" or "brain shield," which is herewith illustrated. Fig. 1 shows the mechanism. Fig. 2 represents my method for controlling hæmorrhage from the scalp. A rubber tube or cord is wound twice around the head and pulled taut; stitches (*b, b*) of silk thread are carried through the scalp and tied around the constrictor at three or four points, to prevent the latter from slipping. I have used this method for ten years with satisfaction. This figure shows the first step in using the brain protector. The watch-spring (2) and brain protector (3), connected, are passed between the skull and dura mater from the first through the second trephine openings. Fig. 3 shows second step. The brain protector (3) and watch-spring (2) are separated, and the Gigli saw (4) is attached to the nub of the spring. Fig. 4, technique for pulling watch-spring (2) with Gigli saw (4) attached through the openings of the skull, leaving the brain protector (3) in position. The saw having emerged from the cavity is detached from the watch-spring

FIG. 1.



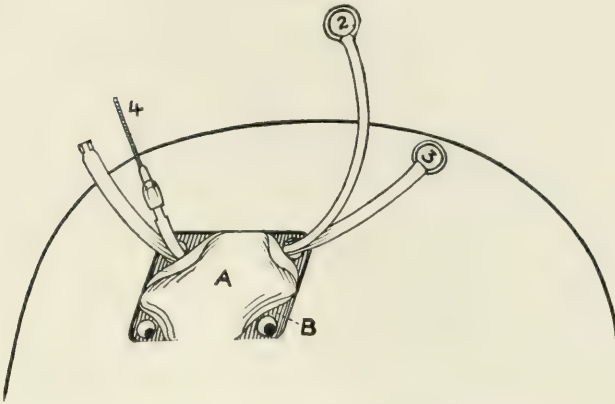
2, Watch-spring; 3, brain protector; 4, Gigli saw.

FIG. 2.



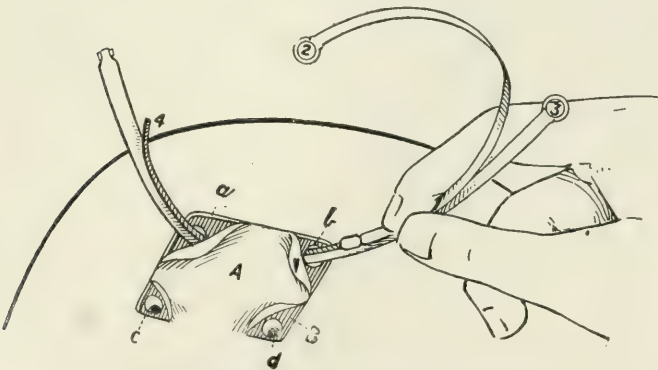
1, Retractor; 2, watch-spring; 3, brain protector. *A*, scalp; *B*, bone.

FIG. 3.



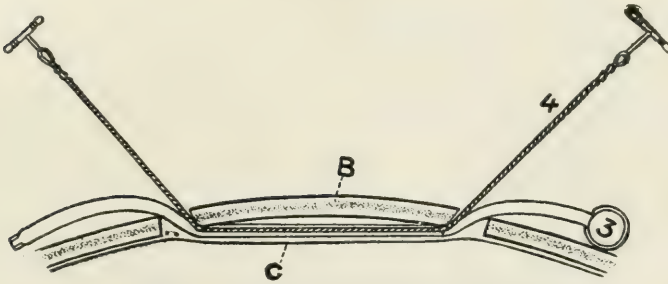
2, Watch-spring; 3, brain protector; 4, Gigli saw.

FIG. 4.



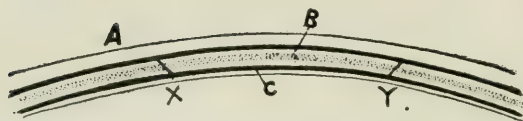
2, Watch-spring; 3, brain protector; 4, Gigli saw.

FIG. 5.



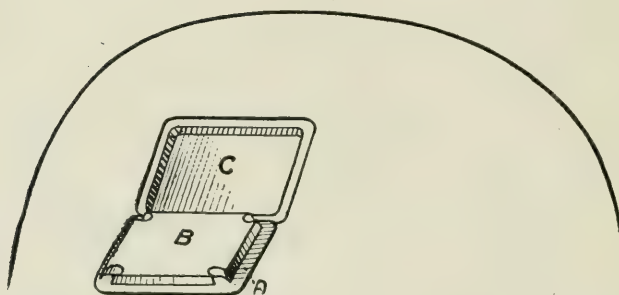
B, Bone; C, dura. 3, brain protector; 4, Gigli saw.

FIG. 6.



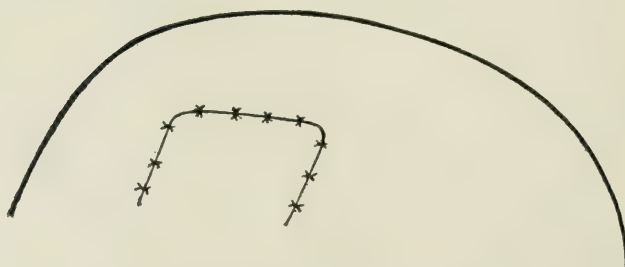
X, Y, Oblique cut; A, scalp; B, bone; C, dura.

FIG. 7.



A, Scalp; B, bone; C, dura.

FIG. 8.



Operation completed; lid replaced.

(2), and is now in position between the skull and brain protector (Fig. 5), ready to cut through the bone. In sawing, bring the saw obliquely through the bone so as to make a ledge (Fig. 6, X, Y) for the bone lid to rest upon. After having cut through one side of the intended lid, the same procedure is carried out (Fig. 4) from *a* to *c* and *b* to *d*. From *c* to *d* the saw is carried through the inner table only, indicated by dotted lines in Fig. 2. Fig. 7 shows the lid of the skull turned down. Fig. 8, lid replaced. Fig. 6, vertical section showing lid resting upon ledge, X, Y. The advantages of this instrument are apparent at a glance. There is absolutely no danger of sawing into the dura mater, an accident which frequently occurs when the Gigli saw is used without the protector. By sawing obliquely, a beautifully even trap-door is formed, leaving a substantial ledge for it to rest upon when closed. The instrument, with a special trephine, is made by Sharp & Smith. Any trephine with one-quarter inch lumen answers the purpose.

PRIMARY TUBERCULOSIS OF THE BREAST.¹

A REPORT OF A RECENT CASE, WITH A REVIEW OF THE LITERATURE OF THE SUBJECT.

BY W. SCOTT SCHLEY, M.D.,

OF NEW YORK,

Assistant Surgeon to Trinity Hospital and St. Luke's Hospital, Out-Patient Department.

THE following case of tuberculosis of the breast entered the Surgical Division at St. Luke's Hospital in the service of Dr. Robert Abbe, to whom I am indebted for the privilege of the operation in the case and permission to report the same.

The patient was a woman, thirty-two years of age, of English nativity, whose mother died of old age, and whose father died at seventy-six. A sister had died of carcinoma of the uterus. The patient had always been well and strong, had had five children, and nursed them without trouble with the breasts.

Present trouble was first noticed eight weeks before admission to hospital, when there occurred a slight dull pain in the right breast. Three weeks later a small lump, the size of a marble, was discovered in the upper and outer quadrant. This remained stationary in size for three weeks. Two weeks before admission the tumor began to grow rapidly in all directions, and the pain became more severe. There is no history of traumatism. Her appetite is good and she is otherwise well.

Physical examination shows an unusually well-nourished woman with good color of skin and mucous membranes. She has no cough and the chest examination is negative. In the right breast, occupying the outer hemisphere and chiefly the upper and outer quadrant, there is a mass the size of a mandarin orange, hard, coarsely nodular in feel, as though consisting of numerous enlarged, hardened, and matted glandular elements, resembling a bunch of grapes with the individual fruit packed closely together. It is not tender. It seems to occupy the site of the glandular

¹ Read before the Society of the Alumni of St. Luke's Hospital, February 13, 1903.

apparatus, and to be quite movable upon the deeper structures. The skin is not adherent, but connective-tissue prolongations from it run into the mass, serving to anchor it to some extent. The breast appears of the same size as its fellow, but is slightly fuller in outline in the outer hemisphere, and there is a slight darkening of the skin over the upper half of the growth. The mass as a whole can be lifted up by the finger inserted under its edge, and when pressed against the skin the individual nodules are very apparent to the eye and blanch the overlying skin. The other breast, both axillæ, and the supraclavicular glands are negative, as are the superficial glands of the body generally. The breast was amputated and the axilla cleaned out. The report of the Pathological Division is as follows:

"Macroscopical examination of the rather large breast shows that it is filled with a soft mass, some six centimetres thick, with irregular edges and numerous connective-tissue strands radiating from it throughout the remainder of the breast tissue. The central portion of this mass is quite firm in structure, and on section shows only dense fibrous tissue with a few ducts, from which a purulent fluid can be pressed. The growth resembles very closely a scirrhus carcinoma. The axillary lymph nodes are slightly swollen, but do not seem to be involved by the process.

"Microscopically, there is a moderate amount of simple adenoma of the breast. There is also abundant infiltration of the connective tissue with small round cells, and in places distinct tubercles with giant cells and central necrosis. The whole of the tumor is diffusely infiltrated with these evidences of tuberculosis, but there are no large cheesy masses and no other evidences of tuberculosis than those given above. The tubercle bacilli were demonstrated in stained sections of the tumor. The axillary lymph nodes are perfectly normal.

F. C. Wood."

Two weeks after the operation the patient was given an injection of seven milligrammes of tuberculin, but showed no reaction. As a control to this test, three other known cases of surgical tuberculosis were given each six milligrammes from the same dilution and gave typical reactions.

That the case is a primary one, as far as we can at present determine during life and without a most complete and searching autopsy, I think is shown by the findings at operation, the result of the controlled tuberculin test, and (especially) by the present condition of the patient and her constant good health since her discharge from the hospital, now nearly four years ago, and living as she has under the same conditions as before her operation.

That tuberculosis of the breast is an uncommon disease, certainly as compared with the malignant and benign tumors of the same region, a search of the literature upon the subject readily shows. Of all the neoplasms of breast reported scarcely more than 100 have been reported as tubercular. A number of these are doubtful and possible examples of simple mastitis in tubercular subjects. If we reject the cases not verified by histological examination or the finding of tubercle bacilli, the number is materially reduced to about sixty-five. In an examination of these again, the number of cases in which the disease may fairly be regarded as a primary one in the mammary gland itself is further very greatly reduced to about twelve, excluding, as we must, all determinable foci of tubercular disease elsewhere, — involvement of axillary and of supraclavicular glands, visceral infection, bone lesions, etc. These occurred in the large majority of the reported cases in addition to the disease in the breast, and must throw doubt upon that organ as the seat of primary infection in those cases. There were many recorded in which the axillary glands alone and of the same side were affected; and it is in this class of case that the most difficulty is experienced in determining the starting-point of the disease. A small focus of disease in the breast, where involvement is usually slower and so small as to be overlooked, may cause enlarged and suppurating secondary glands in the axilla which may be taken for the primary or the sole lesion. On the other hand, we believe that the breast may become infected by way of the axillary lymphatics, a point that is made much of by Halstead and Le Count, Powers, Verneuil, in the collected cases of Berchold, and by Salomoni. Furthermore, the lymphatics from the pleura are believed to play a part as carriers of the infection. It is practically impossible at present to determine with certainty in such cases the original focus of disease. In considerable disease of the breast with slight or absent axillary involvement, it would seem that we may be reasonably certain of that organ as the primary source of infection. In this connection, two cases, seen in private and hospital work within a year, are of interest. There was in each exten-

sive and characteristic tubercular disease of the axillary glands of one side and of the glands along the edge of the pectoral muscle, extending as a mass up to the very margin of the breast tissue, but with no involvement of it as far as could be determined before and during the operation. None had appeared several months later. One of these patients was fifty-three years of age.

To the valuable papers of Halstead and Le Count and Sabrazes and Binaud I am indebted for much from the historical side of this subject.

The history of mammary tuberculosis dates from the publication of Sir Astley Cooper's¹ famous work upon the diseases of the breast, in 1829. Since that time English authors seem to have almost ignored the condition. During the following years and up to as late as 1880, a number of cases were reported but not studied histologically, with the exception of Lancereaux's² case in 1860, the diagnosis being based on macroscopic findings only. Nélaton³ in 1839, Berard⁴ in 1842, Johannet⁵ in 1853, reported cases. Velpeau⁶ in 1854 distinguished three forms of the disease,—disseminated tuberculosis, lymphatic tumors, and lymphatic degeneration. Heyfelder⁷ in 1851 reported the first male case (man of twenty-six years). Horteloup⁸ in 1872, Poirier⁹ in 1883, Demme¹⁰ in 1889, Hebb¹¹ and Schede¹² in 1893, Ferguson,¹³ 1898, and Delbet, quoted by Duplay and Reclus,¹⁴ in 1892 reported cases in males. In 1860 Lancereaux reported a case before the Anatomical Society of Paris, the diagnosis being confirmed by microscopic examination. This appears to be the first recorded in which the diagnosis was so confirmed.

The second epoch in the study of mammary gland tuberculosis began with the presentation of Dubar's¹⁵ Thesis at Paris in 1881, when the diagnosis was based not only upon histological examination but upon the finding of the tubercle bacillus. Dubar reported two new cases and described two forms of the disease,—the isolated or disseminated nodular variety and the confluent. In the first form he regarded the disease as primary in the mammary gland in the majority of

cases, and in the latter as frequently secondary to disease in some other part, usually the axillary glands, but it might result from the coalescence of the nodules of the first form. Ohnacker¹⁶ in 1883 reported two cases, the first in which inoculations into animals (rabbits) were made. Many additional cases, some completely worked out, were reported up to 1891, the year of Roux's¹⁷ inaugural dissertation at Geneva.

Roux gave a complete review of the cases, thirty-one in number, that had been reported up to that time, and added three new ones, in two of which the tubercle bacillus was demonstrated. He also described a third form of the disease, the intraglandular cold abscess. Robinson¹⁸ in 1892 considered the mode of origin of the disease, and concluded that it is not primarily an infection of the gland proper, but first of the connective tissue and later of the gland epithelium, the evidence being in favor of a lymphatic or hæmatogenous origin rather than a duct infection. Dubrueil¹⁹ previously in 1888 had reported a typical example of this pericanalicular fibrosis with pressure and atrophy of the glandular structures.

In 1893,²⁰ Remy and Noel published a case of the disease in a patient of fifty-three years, the most advanced age recorded. Powers²¹ in 1894 reported thirty-five collected cases showing the disease evenly distributed throughout the third, fourth, and fifth decades of life. He found twenty-two cases in married and five cases in single women. Twenty-one of the twenty-two married women had borne children, and nine had had inflammatory troubles of the breast, six of a suppurative character. He believes that the puerperal state and subsequent lactation are not without predisposing influence upon the cause of the disease. Gautier²² in his thesis in 1895 collected and analyzed seventy-seven cases. In but forty-three of these was the lesion demonstrated to be tubercular by histological or bacteriological examination. The bacillus was found in but twenty-two. Sabrazes and Binaud²³ in 1896, together with a review of the literature, presented the most complete work from the pathological and histological side that is to be found. Scudder²⁴ in 1898 collected eighty cases, twenty-three of

which he rejects as lacking in positive evidence. One-half had borne children and the breast had been functionally active. Ten had had inflammatory troubles in the gland at some time preceding the appearance of the tubercular disease. Lactation was active during the development of the tuberculosis but a few times. Among these latter cases I have been able to find one each of Davis,²⁵ Ohnacker,²⁶ Dubar,²⁷ and Pisani.²⁸ Halstead and Le Count²⁹ in 1898 reviewed the history of the subject with an excellent presentation of the symptomatology and clinical course of the disease. They report a case well worked out. Ferguson,³⁰ in the same year, reported the last male case. Freiberg,³¹ also in 1898, and Smith³² in 1902 reported cases that seem examples of secondary involvement of the breast by extension from the axilla through the lymphatics. In Smith's, a lump, first noticed under the arm, gradually increased in size and travelled towards the breast, which later became enlarged and discharged seropus spontaneously. Salomoni³³ and Schifoni³⁴ in 1901 review the literature and report cases.

Tuberculosis of the mammary gland, then, may occur in the male or female and at any age, but is usually found in the third, fourth, and fifth decades of life and in the female, only eight male cases having been reported (three proven). It is more frequently seen after gestation and lactation. The majority of the patients were under thirty-five years of age, a number were under twenty,—the oldest fifty-three, the youngest under one year (Demme).³⁵ Hence it is prone to occur in young adults during the period of functional activity of the gland. In the primary cases the age of the patient and the apparent good health, frequently remarked, are noteworthy. In a case of Souplet's³⁶ and in one of Habermaas's³⁷ this was especially remarked. The relative frequency of the disease cannot be estimated from present data. In general it may be said to be of infrequent occurrence. Heredity would seem to play no greater part here than in tuberculosis elsewhere, and previous lactation and inflammatory trouble to act as predisposing causes to any greater extent than do places of diminished resistance in other parts. Injuries to the breast prior to

the development of the disease have been mentioned in a few cases (Poirier,³⁸ Hebb,³⁹ Sabrazes, and Binaud⁴⁰).

The infection must occur (1) through the ducts of the glands (Verneuil,⁴¹ Verchere⁴²); (2) through a surface wound (Demme,⁴³ Orthmann,⁴⁴ and Kramer⁴⁵); (3) through the blood or lymphatic channels, the generally accepted method; or (4) through contiguity of structure, extension from caries of the ribs or sternum (Heyfelder's⁴⁶ case).

The disease process, as a rule, is slow except during lactation, affects but one side, rarely both, and the axillary glands are enlarged from tuberculosis or simple hyperplastic inflammation. More rarely they are normal. It may in the beginning present no recognizable symptoms, the gland usually preserving its normal size and contour. But it may even be small and insignificant in an advanced case, as in one of Piskacek's.⁴⁷ In comparatively few cases is the volume appreciably augmented. The skin is normal, non-adherent, and without fistulae. Nipple retraction was noted in a moderate number of cases only. Pain is not a constant symptom, and was spoken of as severe in but few of the cases. It seems dependent upon the rapidity of growth of the tumor. Direct nerve involvement has been described by Dubar⁴⁸ and Salomoni,⁴⁹ and by the former as the cause of the pains met with. In the end nearly all become painful, the breast enlarges, the growth undergoes the degenerative changes characteristic of tubercular tissue, and abscesses develop and fistulae form.

In the first, the nodular or discrete form, characterized by its chronic course and painless insidious development, the nodules may be single or multiple. The breast is nearly always unchanged in appearance. The nodules are firm, movable, and distinct, or their outline may be indefinite, merging with the normal gland tissue. They may resemble "lymphatic glands situated on the margin or scattered throughout the breast." *

* In a very early case, in the person of a hospital nurse, under Dr. Abbe's care, whom I had the opportunity to see, the axillary glands were markedly tubercular, while the breast presented but a very small, ill-defined

These nodules may remain of the same size for years and then advance, or they may steadily increase in size over a long period of time. In Scudder's ⁵⁰ case five years, in Mandry's ⁵¹ four years, and in a number between one and two years. If single, they are more frequently found in the upper and outer quadrant. If multiple, they may coalesce and form tumors of considerable size before degeneration and suppuration occur (as in the case herein recorded), and may become attached to the skin or pectoral fascia. Or they may remain distinct and undergo the usual changes, the breast being filled with multiple cavities of cold abscesses. Sometimes a single cavity results. The foci open externally, as a rule, after a time.

Sections through the breast, before degeneration, show distinct, firm, slightly yellowish or wax-colored nodules, from the size of a pinhead to that of a marble, and with a peripheral zone of grayish or bluish tinged, slightly translucent tissue. Between the foci healthy gland substance is seen. Microscopically, the nodules begin as an infiltration, with embryonal cells around the glandular acini and ducts which later become invaded. The centre of the mass is destroyed while the process goes on and spreads at the periphery.

In the second or confluent form, more frequently met with, there is a more acute onset and greater enlargement of the breast. Degenerative changes occur and fistulæ result early, usually in less than a year, and especially in those near the time of lactation or with the tumor situated near the nipple, when it may be a question rather of weeks. Such instances occur in the cases of Habermaas,⁵² Hebb,⁵³ Mandry,⁵⁴ Piskacek,⁵⁵ Davis,⁵⁶ and others.

A single tumor is usually found and situated in the outer hemisphere of the enlarged mammary gland. It presents itself as an irregular, nodular mass, varying in size from that of a walnut to that of an apple or larger, at first hard, but softening

area of induration nearly under the nipple and deep in its mass. The feeling was much that of the sense of caking found in a single lobule of the lactating gland, but with less distinctness.

later and subsequently fluctuating. The breast may be double the size of the sound one and fistulæ are frequently seen.

In this form of the tubercular process, masses extending from the breast towards and as far as the axilla were frequently described, or the breast tumor may be joined to an axillary mass of glands by a band of indurated tissue. This was referred to in the cases of Hebb,⁵⁷ Pisani,⁵⁸ Gaudier and Peraire,⁵⁹ Salomoni,⁶⁰ Berchold,⁶¹ and others. It is regarded as a "characteristic sign of mammary tuberculosis."

In the vast majority of cases the axillary glands were enlarged, and in about 75 per cent. were tubercular. In a number the supraclavicular glands were also enlarged. Spontaneous cure before suppuration must be exceedingly rare, and is not admitted by all to exist. Even after suppuration and discharge, through operation or by nature, few if any recorded cases showed a true healing. The process continues by extension, involving new areas before the older have healed, and death more or less slowly advances when the disease is left to itself, particularly through the involvement of the thoracic viscera.

The examination of the breast in this confluent form finds it firmer than normal, and this firmness is as a solid mass. Sections show an irregular cavity, or several cavities usually communicating, filled with turbid serum, detritus, or puriform liquid. The walls are dense, usually roughened with fringes and villousities. The lining is a soft, grayish or purplish membrane. Externally are found fibrous prolongations into the adjacent tissue. The tissue surrounding these cavities is of increased density and shows small grayish transparent areas, or yellowish opaque spots, representing the extension and infiltration of the tubercular process. Fistulæ may connect the cavities with the exterior.

Roux's third form—the intraglandular cold abscess—is a terminal product, usually of the confluent tuberculosis, and is of slow development. I could find no record of its occurrence in a patient under nineteen years of age (Roux's case⁶²). It occurred more frequently after pregnancy. Diminution in the

size of the breast results. The abscesses are lined by a soft, reddish membrane, and contain a thin pus often with thicker masses of grayish or yellowish material. Tubercles and tubercle bacilli are, as a rule, not found in the walls or contents of these abscesses.

Miliary tuberculosis affecting the breasts has been found at autopsy.

In several cases the earlier symptoms and course of the mammary involvement varied from the usual form. In Orthmann's⁶³ (frequently quoted) it began apparently subcutaneously and resembled an ordinary furuncle. The base became indurated and extended, forming a tumor of considerable size. In Poirier's⁶⁴ two small vesiculated pimples with indurated base first appeared. In Kramer's⁶⁵ an ulcer appeared near the nipple, and later nodules formed within the breast and were connected to the ulcer by a band of indurated tissue. In Denme's⁶⁶ case induration began about the origin of a preformed sinus, the result of a simple mastitis.

In three cases retraction of the nipple was the first symptom noted. In Dubrueil's⁶⁷ two years before the tumor was discovered; in Verneuil's⁶⁸ the retraction began shortly after confinement, five years later a mass was discovered; in Warden's⁶⁹ it was noticed by the patient while carrying her third child, and eleven months after its birth the mammary tumor was found.

In many cases the disease was regarded as primary in the glands and secondarily infecting the breast. A case of Reverdin's⁷⁰ is regarded as a proven example of this. Also eight of a series of thirty-seven collected by Berchold,⁷¹ and Smith's⁷² case, referred to above. Verneuil regards this as the usual method of infection, notwithstanding the known difference in the speed of progress of tubercular disease in the breast and lymphatic glands. Halstead and Le Count lay stress upon this retrogressive lymphatic involvement from the axillary glands and thoracic cavity, and believe that "a primary mammary gland tuberculosis has yet to be confirmed by autopsy." A hæmatogenous origin, however, is not to be

ignored, while infection by way of the ducts is scarcely probable. Powers regards the infection in the breast as probably transmitted from the axillary lymphatics.

Auto-infection, by way of the blood current, from a previously existing focus of disease is probably the usual way.

The scarcity of the tubercle bacilli in the exudates and tissues is generally remarked. Gautier found that they were demonstrated but twenty-two times in seventy-seven cases collected. Scudder but twenty-nine times in eighty cases. Habermas found two bacilli in twelve sections, Piskacek, a few only in 400 preparations. There are other observers who have failed to find them in over 100 sections. In a number of instances the more delicate inoculation test was positive, where they could not be found in sections.

In the cases of more recent years, when a greater number have been examined for the bacilli and inoculations oftener made, the percentage of positive results has been higher.

The diagnosis of tuberculosis of the breast, in its earlier stages, cannot be made from the clinical symptoms and macroscopic appearance. This is particularly true of the discrete form and when enlarged glands or evidences of a tubercular focus elsewhere are lacking. If the disease is well advanced, or tuberculosis exists or has existed in some other part, there is less difficulty. In the majority of cases the diagnosis was not made prior to the operation.

The tumor may be mistaken for: (1) Simple Cysts, (2) Fibro-adenomata, (3) Carcinoma, (4) Sarcoma, (5) Gummata, (6) Actinomycosis. It may also be necessary to differentiate the process from a chronic interstitial mastitis.

Simple cysts are usually more circumscribed, fluctuate earlier, are painless, and there are no axillary glands. Aspiration demonstrates their character. With the fibro-adenomata there will be rather greater difficulty. They are apt to occur in young adults and are of slow growth. The fibromata are commoner, usually more distinctly movable in the gland, and the axilla is free. In Davis's case it is of interest to note that the tuberculosis had apparently been engrafted upon a pre-

existing adenomatous tumor. In the earlier stages of carcinomatous disease there may be confusion. This trouble begins, however, as a rule, at a more advanced age, is usually more rapid and with greater pain. The axillary glands do not suppurate and are not painful at so early a date. Pilliet and Platet⁷³ and Warthin⁷⁴ have reported cases in which carcinoma and tuberculosis existed in the same breast. In sarcoma the growth is rapid and the skin is involved early. The cutaneous veins are apt to be enlarged. Gummata are to be distinguished by the history, coincident lesions, or response to specific treatment. The nodular form of gumma is rarer than the diffuse mastitis of syphilitic disease. In actinomycosis the axillary glands are usually not enlarged. The yellowish-green granulations characteristic of the fungus are formed. In chronic mastitis there is lack of glandular infiltration in the axilla. The feel is less that of a mass and more that of a spread out or diffuse process. In a case that came to me in the out-patient service at the hospital, it seemed necessary to excise a small bit of the tissue under cocaine to make a certain diagnosis.

The treatment of most accessible foci of tubercular disease at the present time is that of removal, with the institution of suitable climatic and hygienic conditions as soon thereafter as possible. Early removal of the breast and axillary glands is the rational method of treatment and offers the best hope for speedy and permanent cure. It is usually unnecessary to include the pectoral muscles. In primary cases and in those with the disease confined to the breast and axillary glands, the prognosis after breast amputation is good. Those of the so-called "tubercular disposition" will have a rather less favorable outlook for the future.

In secondary cases the prognosis depends upon the seat and degree of the primary lesion. Occasionally this will be of sufficient severity to contraindicate radical interference.

In the discrete or nodular form, a removal of the nodule together with a wedge-shaped section of the breast has been recommended, provided the case can be kept under observation

for some time. There are those who prefer to leave the axillary glands undisturbed if they are not appreciably enlarged. Partial operations, however, are not entirely free from risk, although often possible and attractive. Lane's first case is an example of the danger of incomplete operation. The tubercular process and invasion usually extend beyond the point at which the eye ceases to appreciate it.

In the less common cases of cold abscess without changes in the axillary glands or where radical operation is contraindicated, aspiration or incision of the abscess with the injection of iodoform emulsion or of iodine and potassium iodide (Durante's method) has been recommended.

The following methods of treatment have been employed in the cases reported:

- (1) Curetting of sinuses.
- (2) Cauterization of sinuses.
- (3) Injection of sinuses and cavities.
- (4) Incision or aspiration of abscesses.
- (5) Removal of the tumor alone.
- (6) Removal of the axillary glands alone.
- (7) Removal of the tumor and a portion of the breast.
- (8) Removal of the breast and tumor.
- (9) Removal of the breast and axillary glands, the last and safest.

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THE DIAGNOSIS OF INTESTINAL INJURY FOLLOWING ABDOMINAL CONTUSION.¹

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WHEN external signs of penetration of the abdominal cavity are present, as in gunshot or stab wounds, the indications for operative treatment are plain and direct, and scarcely ever is there any hesitancy in the course to be pursued. Not so, however, if a force of unknown velocity or energy has expended itself within the abdomen, leaving perhaps no trace of violence upon the skin or muscular surface. Then it becomes necessary to make a most careful examination of both the subjective and objective symptoms presented by the patient, to separate the trivial from the important points, and with our best judgment to sum up the evidence for or against operative procedure. A few years ago the diagnosis of grave internal injuries was considered sufficient, the patient at the same time being left to the tender mercies of a non-interfering policy. The mortality was correspondingly high, as illustrated by Petry's collection of 160 cases of rupture of the intestine, where 93 per cent. died and 7 per cent. recovered through the formation of abscess with fæcal fistulæ. Other collections of cases give even a higher mortality, up to 97 per cent. and 98 per cent. Unfortunately, there is no pathognomonic symptom present in injury to the intestinal tract, but there are a number of symptoms which, when assembled in the same case, may lead us to form a fairly accurate diagnosis. I purpose, therefore, to review these symptoms and discuss them under separate headings, for the sooner operation is undertaken after the diag-

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nosis is made the greater will be the number of recoveries. The operative mortality at present stands somewhere between 50 per cent. and 60 per cent.

I. *Mechanical Considerations of the Intestine, the Force, and the Abdominal Wall.*—The stomach and intestine may be injured in one of four ways, depending upon the character and energy of the force and the portion of the abdominal wall upon which this force expends itself. It may be crushed, burst, torn, or the blood supply so interfered with that death of the part follows.

First, and perhaps most frequently, the viscus is crushed between the force on the one hand and some resistant portion of the body on the other, as the pelvis or spinal column, or even an object outside of the body, as the ground or a wall. As a result, a more or less circular opening is made in the bowel in a position usually opposite to the mesenteric attachment. If the force is not sufficiently strong to at once make an opening in the bowel, it may so damage the coats of the viscus as to produce a slough, which some time later separates with perforation. Again the force may expend itself upon the weakest coat of the bowel, namely, the mucous, producing an ulcerated or necrotic condition, while the muscular and peritoneal coats remain uninjured, as exemplified in traumatic gastric ulcer or traumatic appendicitis. Such an ulcer may heal without further symptoms or may be the forerunner of perforation, or in healing may produce so much fibrous tissue as eventually to lead to obstruction of the bowels.

Secondly, if the stomach or bowel is filled with food or gas and the force is applied in such a manner as to distend the organ to its utmost, bursting may occur. Under such conditions the peritoneal coat will be more widely lacerated than the mucous. This form of injury is not, however, as common as was formerly thought to be the case, and I have not seen a single example in which I believed that bursting had taken place.

Thirdly, if the force expends itself at some fixed portion of the alimentary canal, as the lesser curvature of the stomach

and the duodenojejunal juncture, tearing of the gut may take place. This may also be the form of injury if the peritoneal cavity has previously been the seat of an inflammation with the production of adhesions.

Lastly, the bowel itself may slip away and escape from the direct force of the injury, leaving the mesentery to be torn or crushed. Then, the nutrition or blood supply to part of the bowel having been destroyed, gangrene of the gut will take place at some later time.

The character of the force will in a way determine the kind of injury that will take place. If it be circumscribed, of high velocity and small inertia, as a kick or a blow from some small, rapidly moving object, crushing of the intestine is more likely to take place; while if the force is diffuse, as in a slow-moving ponderous object of great inertia, the passage of a wheel or a blow from a car-bumper, the bowel is more apt to be torn at one of its fixed points or the mesentery injured.

The rapidity with which grave symptoms will develop depends upon three things:

First, *The amount of food present in the alimentary tract.* When the stomach or intestine contains food or liquid fæces, immediate extravasation takes place with correspondingly rapid development of symptoms. If, however, the injury occurs after a prolonged fast, there may be scarcely a symptom for many hours, as there is no intestinal contents to escape, and also the usual bacterial flora of the mucous membrane is diminished by fasting.

Second, *The portion of the alimentary tract ruptured.* A tear of the stomach or one at the beginning of the jejunum will give symptoms of peritoneal involvement less rapidly than a rupture at the end of the ileum, owing to the fact that the upper intestinal tract contains relatively fewer and less virulent organisms than the lower portion.

Third, When the damage has been less than an immediate perforation, as in mesenteric injury or injury to one of the coats of the bowel, grave symptoms may not appear for hours, days, or even months.

Abdominal Muscles and Fat. — The condition of the abdominal wall, whether it be muscular or not, or thickly covered with fat, may very greatly alter the concentration of the blow, as the thicker the walls the more diffuse does the force become in its passage through, the energy being deflected in radiating lines by the fat and bundles of muscular tissue. Also, the fact that the abdominal muscles are strongly contracted in anticipation of the blow may save the intestine from the violence of a very great force. We have all seen in sparring contests the tremendous blows which one opponent will give the other over the epigastrium; and yet I cannot now recall a single case where such violence produced an injury to the intestinal tract, for the abdominal muscles are strongly contracted in anticipation of such a blow. We have in these various mechanical considerations good reasons why blows of the same force and energy produce different lesions and results in different individuals. Let me relate a few cases illustrative of these mechanical considerations.

CASE I.—A cavalryman during an Indian campaign out West was kicked in the abdomen by a horse. Food was scarce, and the man had been fasting for some time. He picked himself up, rode for hours, and not until he had partaken of food did symptoms of intestinal rupture appear. The post-mortem examination revealed a ruptured gut. I do not know the reference to this case, but think I have quoted rightly the main points of the history.

CASE II.—A strong colored man, aged forty-two years, was struck a glancing blow in the abdomen by a rolling steel ingot weighing two tons. He was knocked down and the ingot rolled over on his left thigh, producing a simple comminuted fracture of the femur. This happened at 8.30 A.M., and the man had not partaken of food since the previous evening. He was much shocked by the accident, but reacted promptly. Fifteen hours later no symptoms had appeared indicative of severe intestinal injury; temperature, 99° F.; pulse, 88; respiration, 22; slight tympany; no vomiting; no rigidity; some pain in region of umbilicus, with natural respiration and no abdominal facies. During the next six hours symptoms of perforation rapidly appeared; pulse and respiration rapidly increased; temperature fell below

normal; vomiting began; tympany appeared with marked tenderness in the region of the umbilicus, and the expression of the face was anxious and drawn. Operation revealed the first part of the jejunum completely torn across, the laceration extending for two and one-half inches into the mesentery; and in another place there was a two and one-half inch tear in the mesentery which had extended into the small gut, and about a foot of the intestine showed beginning gangrene. Death speedily followed the operation. The late appearance of the symptoms in this case was undoubtedly due to the complete emptiness of the upper intestinal tract, and my reason for not operating at once was that I could not believe so enormous a mass of steel would strike the abdomen without inflicting a damage which would at once be patent to the eye.

CASE III.—E. A., white, aged thirty-seven years, a sawyer, was struck in the right inguinal region, at 4.30 P.M., by part of a board which slipped from a circular saw. Shock was profound but reaction good. The abdomen was flat, with some tenderness and pain; no rigidity; breathing regular; no distention. The physician in attendance gave calomel and applied an ice-cap to the abdomen. I saw the patient next day shortly after noon, twenty hours after the injury. There was then present severe pain; rigidity and marked local tenderness; increasing distention; liver-dulness absent; abdominal facies present, but no vomiting. Incision was made in the right semilunar line below the umbilicus, and a perforation found in the lower ileum the size of a lead-pencil on the free border of the gut. The perforation was sharply defined and punched-out in character. Considerable turbid fluid was present in the peritoneal cavity. The opening was sutured, the abdomen flushed with hot salt solution and closed with drainage. Recovery was uneventful. It is interesting to note that the fluid removed from the abdomen at the time of operation gave a pure culture of colon bacillus. This probably represents a crush of the bowel, in which separation of the damaged area with extravasation did not take place for twelve or fifteen hours after the injury.

CASE IV.—G. L., white, aged thirty-five years. A large man of very powerful build, with a thick layer of abdominal fat; a constant and heavy consumer of alcohol; injured at 8.05 P.M., the rear wheel of a chemical fire-engine passing diagonally across the

abdomen from the crest of the right ileum to the left short ribs. No record of the patient's condition for fifteen hours is obtainable. When seen by me his temperature was 101° F.; respiration, 24; pulse, 120 and running; abdominal facies; respiration rapid, shallow, and thoracic; abdomen greatly distended, great pain, and exquisite tenderness, much discoloration of the skin in the track of the wheel.

Operation.—Median incision around umbilicus. Skin and underlying fat entirely stripped from abdominal muscles, with much bruising of the muscles and infiltration of blood. On opening the peritoneum a large amount of blood or bloody fluid gushed out. Three tears were found in the mesentery of the small bowel, two of which were bleeding freely, but the bowel itself was not opened. A beginning gangrene of the gut had appeared in two places from lack of blood supply, and it became necessary to make two resections, one removing fifty-three inches and the other eighteen inches of the small bowel. The abdomen was flushed with hot salt solution and closed without drainage. As much salt solution as possible was left within the abdominal cavity. Drainage was not employed for fear of infection through the bruised and lacerated abdominal wall. At the time of operation two quarts of salt solution were given intravenously. On recovering from the ether he vomited twice, the vomited material containing two small blood-clots. For thirty hours his condition was good. There was moderate distention, which was relieved by two enemata, both bringing away a large amount of flatus and some faecal material. During the evening of the second day he became delirious, and during the night the delirium became very violent and characteristic of mania a potu. On the third day very little distention was present; there were no abdominal symptoms and no signs of peritonitis; the heart, however, was growing weaker, and the delirium was very active and uncontrolled by drugs. Seventy-three hours after operation the heart suddenly failed and the patient was dead in a minute. No post-mortem allowed. This is an example of the intestines escaping from the direct violence of a slow-moving force of great inertia, the force expending itself upon the fixed portion of the mesentery.

CASE V.—Mr. A. E. Barker (*Lancet*, July 21, 1900, p. 164) reports a most interesting case of damage to the upper part of the jejunum which resulted in the formation of a stricture with

enormous dilatation of the gut above. A man aged twenty-one years was run over by a loaded wagon, two broad wheels of which passed across the lower thorax, breaking five ribs. The man recovered from his injuries, but seven years later was operated upon, when a firm fibrous stricture of the jejunum was found seven feet from the duodenum. The wheels had evidently injured the bowel just short of perforation, and during healing a large amount of fibrous tissue had formed, which slowly contracting produced the stricture.

CASE VI is another example of long-delayed perforation after the injury. I am indebted to my colleague, Dr. Harte, for being present at the operation. M. D., white, laborer, aged forty years. Twelve days previously to his admission to the Pennsylvania Hospital he was run over by an empty wagon, the wheel passing across the lower portion of the abdomen. For eight days his temperature remained normal and then became irregular. He complained of pain in the right side of the abdomen. On admission there was marked rigidity of all the abdominal muscles, particularly of the right side, with universal tenderness; slight distention; no vomiting. The abdominal distention gradually increased and the pain became more severe. The next day under ether an incision was made in the right semilunar line below the umbilicus. The muscles were found to be bruised and infiltrated with old blood-clot. On opening the peritoneum there was an escape of gas, followed by fecal material of very foul odor. A large quantity of this material was evacuated; much lymph on the coils of intestine; no perforation of the intestine could be found. The abdomen was irrigated with salt solution and the cavity packed with iodoform gauze; no closure of the wound was attempted. He reacted well after operation, and the next day the abdomen was less distended and the patient more comfortable. He was fed by rectum, nothing being given by mouth. On the second day the wound was dressed and a considerable amount of pus-like fluid evacuated, but with no marked fecal odor. The wound drained well without further fecal characteristics, and the patient made an uneventful recovery.

From a consideration of the various mechanical principles involved in abdominal contusion we gain but small material knowledge. We see that certain kinds of force tend to produce certain kinds of injury in special regions of the abdomen, but

symptoms of the resultant damage may be immediate or greatly delayed through the action of a flaccid or resistant abdominal wall, and the condition of the intestine, whether it be full or empty. However, it is important to gather from the history of the injury as much evidence as possible of the foregoing mechanical principles, for in a case that is doubtful these straws may point to the proper line of treatment.

II. *Symptoms which can be elicited in the Patient, both Subjective and Objective.*—(a) *Shock.* From shock alone we can tell very little. Occasionally very severe injuries will be followed by no appreciable shock, as illustrated in Case I, and again trivial injuries will be followed by most profound shock.

CASE VII.—J. A., white, laborer, aged thirty-eight years. While working at the top of a building, the roof caved in, and the patient fell a distance of thirty or forty feet. He was admitted to the hospital in a condition of profound shock. Complained of pain in the lower lumbar region, buttocks, thighs, and over the short ribs and abdomen, particularly on the right side. There was some rigidity of the abdominal muscles. He reacted fairly quickly, and the next day was more comfortable. The abdomen was then slightly distended, tender, and moderately rigid. Sweating was profuse, respirations short and mostly costal. No abdominal facies and no vomiting. Under calomel his bowels were freely moved and the abdominal distention went down. Within two or three days all signs of abdominal injury had disappeared.

CASE VIII.—M. C., aged two years, was struck by a wagon and rolled along the ground, but the wheels did not pass across the body. On admission to the hospital the patient was in a state of profound shock. Numerous contused areas were visible on the legs, head, and abdomen. Abdominal pain and tenderness very marked; also slight rigidity of the muscles. No vomiting. Reacted well, but was extremely restless for forty-eight hours, at the end of which time the abdominal symptoms had disappeared and recovery speedily followed.

The speed with which reaction from shock takes place tells us nothing, for when shock is unassociated with hæmorrhage, very severe injuries may react promptly to stimulation.

(b) Temperature at first is a guide only to the degree of shock; but when reaction has taken place and it has risen above

normal, a secondary fall to below the normal, with an increasing rapidity of pulse and respiration, is indicative of most serious trouble.

(c) A steadily rising pulse after reaction has taken place is also a bad sign, but it must be associated with other symptoms to prove alarming.

(d) Respiration in the presence of shock is usually quiet and shallow. To be indicative of an intra-abdominal lesion, it must be short, frequent, and thoracic in type. It may have all of these characteristics, however, from a simple severe contusion of the abdominal wall where the muscles are bruised and painful, and also in the presence of marked tympany where the abdominal muscles are prevented from acting by the distention.

CASE IX.—S. G., white, a driver, was kicked by a horse in the epigastric region. Shock moderate; complained of intense pain in the abdomen. There was a contused area over the epigastrium, with great tenderness and muscular rigidity. Respiration was painful, jerky, and thoracic. Abdominal facies and vomiting absent. He reacted well and promptly. In two days he was very much more comfortable, and in another two days had entirely recovered, although some tenderness still remained in the epigastric region.

CASE X.—L. S., white, brakeman, aged twenty-eight years, fell off a bicycle and was thrown under the wheels of an automobile cab, one wheel of which is said to have passed over his body about the epigastric region. On admission he was in profound collapse; pulse imperceptible; extremities cold. He complained of great pain over the abdomen, especially in the epigastrium. Respirations short and thoracic; marked epigastric tenderness and rigidity; no vomiting. Reacted well and quickly. Next day there was evidence of swelling in the epigastric region. The patient, however, continued to improve, and in a week's time was entirely free from pain and tenderness.

When, however, we have increasing shallow thoracic breathing without distention and without sign of abdominal bruise, and associated with muscular rigidity, it becomes an important symptom of considerable value.

(c) *Facial Expression.* The abdominal facies consists of a peculiar drawing of the lines and deepening of the furrows of the face, which give an anxious, careworn, and painful expression to the countenance, while the eyes are questioning and anxious, and search the faces of the people about. A lack of knowledge of drawing prevents me from painting this picture in words, but when it has been seen a few times it gives a very characteristic expression or stamp to many different types of face. It is not present in shock, but comes on after reaction has taken place, and is perhaps concomitant with development of peritoneal inflammation. When present, it is to me the most positive of all the symptoms of severe intra-abdominal injury. I have failed to see it, though, in several injuries, but I cannot recall ever having noted it as present in a case which failed to show a serious lesion. I suppose there must be exceptions to this, but I judge they are rare.

(f) *Pain, Tenderness, and Muscular Rigidity.* Pain and tenderness are always present in severe injury, but they are also present in simple contusion of the abdominal wall. Often, however, we can elicit from the patient the fact that the pain or tenderness seems superficial, or that it is deep and radiates to the back or loin or pelvis. Under such circumstances, when pain is deep and radiating, it becomes significant. Marked rigidity of one or both recti muscles is frequently present in simple abdominal contusion, but it is usually at its height from the start, and gradually diminishes as time passes. Again, if the palpating fingers are moved gently over the abdomen for some time while the attention of the patient is distracted from this region of the body, the rigidity will be felt to yield slowly, to become prominent again on sudden pressure. In other words, the patient, knowing that the part is sensitive, voluntarily keeps the muscles contracted for fear palpation will increase the pain. The rigidity which is characteristic of an intra-abdominal lesion is progressive in its firmness, and when well developed is of board-like hardness, neither increasing nor decreasing under palpation. However, such a distinction is not always characteristic, as the following cases will show.

CASE XI.—A. L., white, plumber, aged nineteen years. Two days before admission to the hospital he fell against a box, bruising the right flank and right side of the abdomen, since which time he has had increasing intra-abdominal pain, with increasing distention, vomiting, and no movement of the bowels. On catheterization the urine was found quite bloody. The right rectus was rigid, with great tenderness over the whole right side of the abdomen and flank. Moderate tympany was present; liver-dullness decreased. Operation was urged and declined. Under treatment the man gradually improved, with less abdominal pain and a decrease of tympany. The bowels were well moved. Hæmaturia persisted, but at the end of two weeks the blood in the urine was only microscopic. Recovery was uneventful.

CASE XII.—J. C., white, laborer, aged thirty-nine years. While unloading a wagon he was struck in the back by a sack of grain, causing him to fall forward against the pole of the wagon, the pole striking him in the pit of the stomach. There was immediate nausea, almost unconsciousness, with great abdominal pain. When seen a few hours later no shock was present. There was considerable tenderness over the abdomen, with rigidity of the muscles of the upper portion. No further vomiting, no abdominal facies. The next day the patient felt quite comfortable, except for abdominal tenderness. The recovery was uneventful.

CASE XIII.—M. P., white, aged eight years, was knocked down and run over by a wagon, the wheel or wheels having apparently passed over the abdomen above the iliac crests, with evidence of contusion of the abdominal wall. The patient was dazed and considerably shocked; abdomen rigid and tender; no vomiting; no abdominal facies. Reacted well and abdominal pain gradually disappeared. Recovery was uneventful.

(g) *Tympany*. Frequently a small amount of tympany or even moderate distention is present a few hours after abdominal contusion without any severe intestinal lesion. Under such circumstances it is probably a manifestation of a transient intestinal paresis, readily yielding to a high enema with the passage of flatus. Distention, however, which is progressive and extensive, or which appears late, a day or more after the injury, is worthy of very serious thought, especially when associated with other signs of obstruction. It then becomes a grave symptom.

(h) *Liver-Dulness.* Diminished or absent liver-dulness in the right nipple or anterior axillary line has been a most unsatisfactory symptom to me. It may at times indicate free gas in the peritoneal cavity, but intestinal distention will give the same sign, and I have seen liver-dulness completely absent without a particle of gas in the peritoneal cavity. In my experience I have been unable to place a just value upon this symptom.

(i) *Vomiting.* Vomiting that occurs immediately after the accident has no practical significance, for there are few people who can stand a sharp blow in the abdomen without being nauseated. When it appears after reaction has taken place, or even a day or more after injury, it becomes a symptom of great importance. It is then usually associated with distention and obstruction.

(j) *Singultus.* Obstinate and continuous hiccough I have seen but once, where it was a late symptom in a contusion of the epigastric region. I should judge that it occurred only in injury of the bowel adjacent to the diaphragm, and was due to the irritation of the peritoneal covering of the diaphragm. When present, it must be a symptom of the greatest import.

(k) *Leucocytosis.* So many factors at the time of injury besides a ruptured intestine may induce an increased leucocyte count that I feel little reliance can be placed upon this symptom when present in the first twenty-four hours. In such cases, where perforation takes place late, it might be an aid to diagnosis, but owing to the frequency with which we see contusions and injuries to other portions of the body associated in the same case with abdominal contusion, it would be impossible to say to which injury we should attribute the increased leucocyte count.

The histories of the cases presented in this paper have been chosen for the most part from thirty or thirty-five patients that have come under my own observation. They were picked out because they illustrated one or more of the points under discussion, and I have tried as far as possible to be brief and to omit all useless repetitions.

Conclusions.—What conclusions may we fairly draw from these remarks and the histories just detailed?

First. That a moderately assured diagnosis of grave injury must be made before operation is undertaken, or we will open many abdomens to find the trauma confined to the abdominal wall. In a series of 100 consecutive cases of abdominal contusion as they enter a general hospital, perhaps thirty or forty will have received a grave injury demanding operation, while the other sixty or seventy recover without any operative procedure. For the sake of argument, I am willing to grant that if the abdomen is immediately opened in each one of the 100 cases there will result a smaller percentage of deaths than if the surgeon waits for some other symptoms of intestinal damage. But can we call such radical and empirical treatment the science of surgery? Would any of us receiving a blow on the stomach sufficient to shock and nauseate say, "Have Dr. ——— see me, for I want my abdomen opened at once?" Answering for myself, I say, No; for I should wish the surgeon in attendance to be moderately assured of his diagnosis before I took that smallest of risks, viz., an abdominal section in the hands of the most skilful surgeon. If I were one who always, without exception, advocated immediate operation in appendicitis as soon as the diagnosis is made, I could with greater force urge immediate operation in all cases of abdominal contusion, for the seriousness of the two conditions is scarcely comparable to my mind.

The teaching of many of the modern writers when they urge operation in all cases presenting pain, rigidity, and local tenderness seems to me too radical, for we have various kinds of pain and tenderness and different degrees of rigidity, and many times these symptoms are due to injury of the abdominal wall alone. Had I followed such teaching, I should have opened the abdomen in Cases VII, VIII, IX, X, XII, and XIII, for each of them presented pain, localized tenderness, and rigidity, and yet they all recovered without an exploratory operation.

My belief, then, is that we should wait for some symptom or symptoms indicative of intestinal injury.

Second. In the presence of shock we cannot make a diagnosis of intestinal injury, no matter how profound the shock may be or how slowly reaction takes place. We may diagnose hæmorrhage, which would lead to an immediate operation, and at the same time presume the presence of a lacerated gut, but primary shock is of itself no aid to our diagnosis. I would therefore wait for reaction to take place.

Third. No one symptom is pathognomonic of intestinal injury, but the two most reliable are gradually increasing rigidity and facial expression. In the next group I would place deep and perhaps radiating abdominal pain, respiration which becomes more and more thoracic, vomiting after the shock has ceased; distention, increasing pulse-rate, and secondary fall in temperature. The order in which I have mentioned them has no significance, for any one or two of these symptoms may be prominent to the exclusion of the others.

Fourth. Any individual who has received an abdominal contusion sufficiently severe to call for your services demands also the most careful and constant watching in order that you may detect at the earliest possible moment the appearance of grave symptoms. I do not mean that we should wait for these symptoms to become so pronounced that a positive diagnosis is assured, for then operation is for the most part too late. There is a position, however, midway between operating on every case and waiting for an assured diagnosis, where we can say that, owing to the gradual appearance of certain symptoms, we have fair reasons to think the intestinal tract may be injured, and that under such circumstances an immediate operation will give the patient the best chance. In such a case we must not forget the possibility of perforation taking place hours or even days after the injury.

Lastly. As our individual experience increases, we gain the power to place a more just value upon the symptoms present and to perceive the grave symptoms in their early stages. In other words, we gain in acuteness of perception, and there is scarcely any injury to the body which requires this more for a successful result.

HEPATIC DUCT STONES.

WITH REPORT OF A RECENT OPERATED CASE.

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A REVIEW of the somewhat extensive literature of gall-stone disease discloses the fact that not more than 70 per cent. of operations for the removal of calculi from the gall-bladder are uncomplicated.

The complications, eliminating carcinoma, adhesions, intestinal obstruction, hepatic abscess, impinging tumors, empyema or gangrene of the gall-bladder, and referring solely to stones in the bile ducts, appear in fully 15 per cent. of the reported operations for gall-stones.

It is unquestionably a certainty that stones are formed in the bile passages as well as in the gall-bladder; most frequently in the cystic and common ducts, very rarely in the hepatic duct, and still more rarely in the small divisions of the hepatic duct, or liver substance. That the formation of calculi in the ducts is dependent upon primary pathology in the gall-bladder, and not altogether upon local abnormal conditions, is an open question, and one which has an extremely important bearing upon the future of gall-stone surgery. It is certain that a neglected case of gall-stone disease offers not only the possibility of the passage of stones from the gall-bladder into the cystic or common duct, there to become lodged and subsequently enlarged, but the further possibility that stones may be directly formed in the bile passages, a possibility which goes nearer and nearer to certainty as the case progresses without surgical intervention.

In operative cases reported, stones had been found in the bile ducts—with or without calculi in the gall-bladder—in order of frequency as follows:

- (1) Stones in the cystic duct;
- (2) Stones in the cystic and common ducts;
- (3) In the common duct only;
- (4) In the cystic, common, and hepatic ducts.

A fifth classification should be, stones in the hepatic duct only. I find no reported cases of isolated stone or stones in the hepaticus, and cases of calculi in either the hepatic duct or its primary divisions or small branches associated with stones in the common or cystic ducts, or both, are rare.

Mayo, in his series of 326 operations, mentions having found stones in the hepatic duct in but five cases, all associated with others in the cystic or common ducts.

Ochsner, in reporting forty-eight cases, does not mention stones in the hepaticus.

Mayo Robson, in his report of 305 cases ("Diseases of the Gall-Bladder and Bile Ducts"), cites but four instances of hepatic duct stones, all of which were associated with calculi in the common duct. In Case 236, the common duct was opened and a finger passed into the hepatic duct, stones felt, and removed with the scoop. Case 113, stones were removed from the cystic duct, evidently through the opening in the gall-bladder, and "several crushed in the common and hepatic ducts."

Case 179. Numerous stones in gall-bladder and the three ducts; those which could not be "milked" into the gall-bladder were crushed.

Case 217. Common duct incised and stones removed. Other stones evidently small were felt in the hepaticus, and removed with the small scoop through the opening in the common duct.

Kehr, whose work on "Gall-Stone Disease" is based on 547 operations, makes specific mention of but three instances of stones in the hepatic duct, although he has repeatedly employed hepatic drainage by tube through a common duct opening. He notes a case of a series of stones in the common and hepatic ducts in which the common duct was opened and calculi removed by "tedious extraction." A drainage tube was

placed in the hepaticus. The case did badly after operation; bile, "evil-smelling and muddy," with symptoms of stones still remaining in the hepatic duct. The tube was removed and replaced after irrigation of the duct. The stone which had remained in the hepaticus was removed by the washing process on the fourteenth day, the duct having previously been tamponed with gauze, to move the stone down by pressure of bile from above. Drainage and irrigation of hepaticus continued with eventual recovery. He mentions a second case of large stones in the common, and smaller stones in the hepatic; and a third of stones in the gall-bladder and the three large ducts, in both of which cases the calculi were removed through an incision in the common duct.

Jacobsen notes a case of Thornton's in which 412 stones were found, "a majority lying in a cavity in the liver substance" with large impacted stones in the common duct, and others in the hepatic duct and upward in the liver.

Ross mentions a case of "medium-sized stones lying in a row in the hepatic duct" which "milked" through the cystic duct into the gall-bladder and removed.

Morison reports case of stones in the gall-bladder, common and hepatic ducts; cholecystostomy and choledochotomy were performed, the common duct evidently being the site of latter procedure.

Author's Case. Referred by Dr. R. C. Cupler, to whom I am indebted for details of preoperative history and after treatment.

Mrs. R., German, aged forty-one years, weight something over 200 pounds; disposition decidedly neurotic. Family history negative; no remembrance of any relative suffering from cholelithiasis. Has had six children, four living at present. Patient had always been in good health with exception of the ordinary diseases of childhood, including scarlet fever, until twenty years of age, when her first child was born. A few months after labor she was seized with severe abdominal pains; a physician was called and morphine administered. The pain was relieved, but on the following day the patient suffered from anorexia, nausea,

and vomiting, and noticed a coloring of the skin (jaundice). Like attacks of colic followed each succeeding pregnancy with some few seizures between.

During the two years previous to operation she had many attacks of colic with no jaundice, and had a constant pain under the right scapula. Had a troublesome cough for past five years, at times a brisk hæmoptysis, nocturnal dyspnœa, shortness of breath on exertion. Had facial neuralgia and migraine at times for the past fifteen years. For the shoulder pain, hemicrania, and abdominal pains, she had been taking daily from two to six neuralgia pills with morphine. During the attacks of colic, pain was apparently in epigastrium, radiating to right scapula. Had been troubled with insomnia. Menstrual history negative; no abortions or miscarriages; bowels only occasionally constipated.

Physical examination revealed large pendulous abdomen, wall extremely obese. Liver somewhat low, not sensitive on pressure or percussion. No points of abdominal tenderness except centre of epigastrium; no tenderness over gall-bladder, with apparently no pain on deep palpation or "prodding."

Chest. Respiration, 10; chest barrel-shaped, with widened intercostal spaces; slight expansion on deep inspiration. Resonance increased, upper line of liver-dulness low. Heart-dulness indistinct; heart sounds generally weak. Breath sounds enfeebled. Sibilant râles.

Bimanual examination of pelvis revealed enlarged and tender left ovary, uterus retroflexed, cervical tear, perineal floor relaxed.

Hæmorrhoids present. Few palpable inguinal, axillary, or cervical glands. Skin moist and clear. Pulse, 90, regular, soft. Temperature, 99° F. Urine showed indican only.

Diagnosis. Gall-stones, probably involving common duct as principal trouble; based on clinical history.

Operation made under chloroform anæsthesia, July 26, 1902. Incision parallel to rectus downward from tip of tenth costal cartilage. Fat two to three inches in thickness. Straight incision through muscles and peritoneum. Immediately upon dividing the peritoneum, the gall-bladder presented in upper angle of the wound, and was easily delivered. It was fully six inches in length and much distended. Palpation revealed three stones,—two floating about, and one apparently blocking the entrance to the cystic duct.

Deep palpation showed the cystic and common ducts apparently clear. Surrounding tissues and viscera normal. A concretion, size of a pigeon's egg, was felt high up under the liver in the gastrohepatic omentum. On account of the great depth, due to the thick abdominal wall and the location of the concretion, I was unable at this stage to determine its exact locality and relations.

The stone blocking the cystic duct was readily milked into the gall-bladder. This stone evidently acted as a "Fenger ball-valve," and to it I attribute the retention of bile in gall-bladder and the subsequent distention.

The abdominal cavity was carefully walled off with gauze packs, the gall-bladder surrounded with pads, opened and emptied of bile. The three stones, each the size of a marble (weight, thirty-five grains) and with six facets, were easily removed with the scoop. Bile was clear and without odor. No sign of cholecystitis.

After clearing the gall-bladder, it was thoroughly washed out with normal salt solution, wrapped in clean gauze, and drawn out and over the upper angle of the wound.

The abdominal incision was then lengthened downward until about eight inches in length through skin and fat, and five inches through muscle and peritoneum,—parenthetically, this I believe to be an important point in the technique of abdominal surgery. There being no particular value or strength in the skin and superficial tissues, the length of the external incision is immaterial. In operating upon an obese patient, by making a long incision through skin, superficial fascia, and fat, with these tissues well retracted, the operator has practically a thin wall to work upon, and a short incision through the deep fascia, muscle, and peritoneum will suffice.

With the incision enlarged, the liver was lifted up, colon retracted downward, and stomach and duodenum carried downward and to the left as far as possible, thus placing some traction on the gastrohepatic omentum.

The field was again thoroughly walled off by gauze pads, which together with the viscera were held in place by long retractors.

A careful examination showed the common duct clear; the cystic duct was palpated from its origin downward to its union

with the common duct, and proved to be free from calculi. The large concretion proved to be a stone in the hepatic duct, lying with its lower extremity about half an inch above the junction of hepatic and cystic. The duct was apparently sacculated, the stone being freely movable upward and downward for the distance of half an inch, and could also be rotated on its long axis. There was no impaction and evidently no obstruction to the biliary current. The hepatic duct was not enlarged below the stone, and was clear above.

It was found impossible to "milk" the stone downward, and an attempt to crush the calculus proved ineffectual. At the anterior border of the lower end of the stone appeared a sharp, knife-like edge, over which the tissues were very thin, and showing that perforation was imminent.

An incision was made through the omentum and duct wall directly down upon the stone, keeping a trifle to the right to avoid possible injury to the hepatic artery or portal vein. The stone was then delivered lower end foremost. The stone was non-faceted, hard, but not particularly heavy, weighing 250 grains, and measuring in length one and three-fourths inches and three and one-fourth inches in circumference.

Because of the condition of the biliary passages, I did not think hepatic drainage necessary or advisable, so proceeded to suture the duct. Lambert sutures were placed in the duct wall at the extreme upper and lower angles of the incision. These, when tied with the ends left long, served as traction sutures, and held in long forceps by an assistant greatly facilitated the remainder of the sewing. The wound in the duct was closed with interlocking sutures (*i.e.*, author's interlocked Halsted stitch) of fine catgut, a small, fine curved needle being used. Over the line of union thus formed the peritoneum was closed by a continuous right-angled Cushing suture of 00 catgut. Field of operation wiped clean and packing removed. Two inches of upper portion of gall-bladder were then cut away, and cut edges of the viscus sutured to the parietal peritoneum in the usual manner with interrupted sutures of catgut. Remaining peritoneum closed by continuous suture. Muscle and fascia united with interrupted catgut. A rubber drainage tube was placed into the gall-bladder, iodoform gauze being wound about the tube from the peritoneal level outward. Skin and superficial tissues closed with silkworm gut,

and a dressing of fluffed gauze, rubber dam through which the tube emerged, and combination pads applied.

Upon awakening from the anæsthetic, patient complained of much pain, which was constant for forty-eight hours, when it became intense, with abdomen distended, tympanitic, and very tender. Pulse, 140; temperature, 103° F. The tube was elevated, it evidently having caused some pressure pain. Hot turpentine stupes constantly applied to abdomen. Insertion of rectal tube was followed by return of good deal of flatus. Patient improved in every way the following (third) day. Tube drained freely. Bile clear and sweet; daily dressings; on the sixth day the tube was removed and iodoform gauze drainage substituted. Uneventful course, with daily dressings for five weeks, when patient left hospital. Small sinus remained, discharging small amount of bile. The sinus closed during the sixth week, but on the second day following the closure patient had a severe attack of colicky pain, which lasted several hours. The sinus opened spontaneously with an expulsion of bile sufficient to saturate dressings and clothes. The sinus was gently curetted and healed promptly. There has been no further trouble, discomfort, or pain. The patient is now (January, 1903) in excellent condition, and complains only of a cough, which is not so distressing as before operation, and an occasional attack of nocturnal asthma.

In my work upon some hundreds of cadavers, in many of which gall-stones were present, I recall but one instance of calculi in the hepaticus, either alone or associated with stones in the other passages. In that subject a large isolated stone was found in the hepatic duct during the course of a demonstration of the operation of choledochotomy at the Post-Graduate Laboratory, by Dr. Paul Gronnerud, who has kindly furnished me with the following description:

“Subject, female cadaver about forty years of age; death due to pulmonary tuberculosis.

“Region of liver and gall-bladder apparently normal, no adhesions or sign of disease of contiguous viscera. The gall-bladder was empty and small; a probe was easily passed from the gall-bladder through the cystic duct, demonstrating no stricture or obstruction of that passage. Palpation and later dissection

showed the choledochus normal and unobstructed throughout its course. There was no sign of inflammatory changes in the gall-bladder, cystic or common ducts. The hepatic duct, however, contained a single stone, situated immediately above the junction of the hepatic with the cystic ducts. The stone was movable—upward, downward, and to each side—for a short distance. It was contained in a pouch-like enlargement of the hepaticus, and evidently had not offered obstruction to the flow of bile.

“Upon opening the common duct, a probe could be passed beyond the stone into the right and left divisions of the hepaticus.

“The calculus was smooth, hard, and round, non-faceted, and somewhat larger than a common marble. Could not crush the stone or force it downward. Post-mortem rigidity of the duct wall probably prevented the latter procedure. The calculus was removed through an hepatic duct incision, which was closed by interlocking sutures. There were no further concretions in the hepatic duct, its branches, or in the liver. A small amount of biliary sand was, however, found in the liver substance.”

The conditions found will be seen to closely resemble those in my own operative case, with the exception that in the cadaver there were no stones in the gall-bladder and no dilatation of that viscus. In both instances the common duct was patent.

While it is undoubtedly true that in a majority of cases of stones in the hepatic duct the condition is due to an obstructed or impacted common duct, thereby forcing stones which have formed in and passed from the gall-bladder upward, these cases of isolated hepatic stones add their modicum of proof to the hypothesis of the local formation of calculi in the bile passages.

A consideration of hepatic duct stones inevitably brings out prominently three points, namely, (1) that the possibility of such locality of calculi should not be overlooked; (2) methods of operative technic, and (3) the question as to whether or not the presence of stones in the bile ducts is dependent upon a pathological gall-bladder or pathological conditions within that viscus.

The operation of incising the abdominal wall and immediate suture of gall-bladder to the parietal peritoneum, without

first carefully examining, not only the cystic, common, and hepatic ducts, but the contiguous viscera and tissues, and, in the light of recent disclosures, the vermiform appendix as well cannot be too strongly condemned.

The rarity of calculi in the hepatic ducts apparently justifies the standard text-books in omitting more than mere mention of the operative technique of this condition; a majority of works omit the subject altogether.

- Richardson, in Park's "Surgery," states that "operations upon the hepatic and common ducts are indicated when stones are impacted in either, and cannot be removed by dilatation of the cystic duct, or by reasonable efforts at crushing" after incision, closure of the ducts by suture.

Mayo Robson states that "if a gall-stone be found in the hepatic duct, it may be reached by opening the common duct and passing scoop or forceps through this opening."

Kehr describes a like procedure. Robson, however, has been fortunate in having been able to crush stones *in situ*. I believe that the hepatic duct as readily admits of successful operative procedures as the common or cystic. Its anatomical position, however, presents technical difficulties which may be surmounted by a long straight incision through the abdominal wall, upward traction on liver, and a clear field provided by proper placing of packs, and use of long retractors.

In cases of hepatic calculi, (1) an attempt should be made to "milk" the stones through the cystic duct into the gall-bladder; (2) "reasonable efforts should be made to crush the stones," though the advisability of this procedure may be questioned in cases of numerous stones, on the ground that small pieces might remain in the duct and form the nucleus of further concretions. (3) In cases of calculi in both common and hepatic ducts, if the stones are small, an incision in the common duct will admit of the removal of the stones from both passages, the upper stones being brought down by scoop or forceps. (4) Direct incision of the hepatic duct should be made in cases where it is found impossible to "milk" or crush the stones; where it is apparently impossible to force the calculi down into the common duct, and in cases of large isolated stone.

After incision of the hepatic duct, the vitally important question as to suture or drainage must be decided by the exigencies of each individual case, and just in this connection the question of the formation of calculi being dependent wholly upon pathological processes within the gall-bladder only has a most important bearing. There is no doubt but that the common or hepatic duct may be closed with perfect success in certain cases; but I should hesitate to close either the hepatic or common duct when numerous stones have been removed from these ducts, even should cholecystectomy be performed. In cases of cholangitis, drainage of the hepaticus always! and whenever, according to Kehr, the bile is "evil-smelling and muddy."

It seems safer to assume that stones may be formed in the bile ducts independently of gall-bladder influences; and arguing upon that assumption, unless the case is undoubtedly uncomplicated, or one with a few or a single large stone in the ducts, with no sign of cholangitis, and with the bile clear, simple drainage of the gall-bladder, removal of mucous membrane, and cholecystectomy may all prove insufficient, and drainage of the hepatic duct by tube through a direct incision or common duct opening should be instituted.

Kehr's large experience impels him to say, "Advance will only be made in the operative treatment of gall-stone disease when we treat the cystic, common, and hepatic ducts as we now do the gall-bladder, viz., open and drain."

PRIMARY CARCINOMA OF THE VERMIFORM APPENDIX, WITH A REPORT OF THREE CASES.¹

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THE exceedingly infrequent occurrence of primary malignant neoplasms of the vermiform appendix has long been a subject of comment among surgeons and pathologists. In the voluminous literature devoted to diseases of the appendix there are but comparatively few references to malignant diseases of this organ, and some of these are decidedly unauthentic. This appears to be especially true of the earlier cases reported. In order that some idea may be gained as to the accuracy of these observations, the writer has taken the trouble to look up the original reports, where such exist, of practically all the cases in the literature.

The first reference to carcinoma of the appendix is a case reported by Merling¹ in 1838. The report was of the findings at an autopsy upon a case which had died of general peritonitis. The wall of the appendix was thickened, scirrhus, and of a grayish-brown color. Furthermore, it appeared to be occupied by several small hard tumors. Near the attachment to the cecum the appendix presented a small ragged opening the size of a pea, through which the intestinal contents had escaped into the peritoneal cavity. Although assumed to be a case of primary carcinoma of the appendix, no mention was made of a microscopical examination, and it would appear to be much more probable that it was a case of perforative appendicitis.

The next mention of primary carcinoma of the appendix

¹ Read before the New York State Medical Society, January 28, 1903.

was a case reported by Prus,² in 1865, of a woman of seventy-five years of age who died with symptoms of general peritonitis. At autopsy the peritonitis was found to have originated from a large perforation of the wall of the appendix. The mucous and muscular walls of the appendix were thickened. From the base of the ulceration about the perforation there sprang a small, soft sessile tumor, which on section showed some hæmorrhage. No mention was made of a microscopical examination, and it would also appear that this case was not one of primary carcinoma of the appendix.

The first important article upon the subject was that of Rokitansky,³ who in 1867 reported four cases of what he believed to be primary carcinoma of the appendix. He called attention to the fact that prior to that time carcinomatous degeneration of the appendix had been scarcely recognized among the diseases of that organ.

The first case, which was observed in 1847, was that of an individual eighty-two years of age who died of pulmonary disease. At autopsy the appendix was found to be transformed into a sac six inches in length and two inches in diameter. It was situated to the outer and posterior side of the cæcum, to which it was densely adherent, and into the lumen of which it had caused a projection. The walls of the appendix appeared fibrous in character and the cæcal orifice of the appendix was obliterated. The sac which represented the degenerated appendix contained a yellowish white, opaque, gelatinous mass, which was streaked with blood. The wall of the sac consisted of fibrous tissue which had completely replaced the mucous and muscular coats, and upon the inner surface presented an areolated, reticulated appearance, the reticulæ traversing the gelatinous material and dividing it more or less into compartments.

The second case, observed in 1854, was that of an individual sixty-eight years of age who died of pneumonia. The appendix was two inches in length, and the distal two-thirds was transformed into a spindle-shaped fibrous sac about the size of a pigeon's egg, which contained a yellowish gelatinous material traversed by fine reticulated processes which took their origin from the wall of the sac.

The third case, observed in 1866, was that of an individual seventy years of age who died of heart disease. The appendix was four inches in length, and the distal, 2.9 inches, was transformed into a sac distended with a gray gelatinous material. This portion of the appendix was about one inch in diameter, and the wall, which was one-tenth of an inch in thickness, was of a fibrous character. The entire surface of this sac was smooth in some places, while in others it was irregular, and from it numerous delicate processes ran in different directions through the gelatinous material.

The fourth case, observed in 1866, was that of an individual thirty-eight years of age who died of pulmonary and intestinal tuberculosis. The appendix was 1.9 inches in length and consisted of two compartments. The distal, lined by a smooth mucosa, contained a grayish gelatinous material, while the proximal compartment was distended with a gelatinous material traversed by numerous delicate strands of tissue, which appeared to originate from the fibrous wall of the compartment. The walls of the appendix in this region appeared to be transformed into fibrous tissue.

Rokitansky concludes that this disease of the appendix consists of a stenosing colloid carcinomatous degeneration, which results in an enlargement and distortion of the organ and the transformation of its wall into a fibrous capsule. There is no discussion of the microscopical appearances of any of these specimens, and, hence, there is some question as to whether they were really instances of carcinoma, and not mucoid degeneration or dropsy of the appendix.

Kolaczek,⁴ in 1875, reported a case of abscess in the right iliac fossa which opened and the fistula failed to heal. At autopsy a carcinoma of the cæcum was found, which connected with the fistula. The base of the appendix opened at the site of the ulcerated carcinoma, but no mention was made of involvement of the appendix.

This case is here mentioned because of the fact that it has been frequently referred to in the literature as an instance of primary carcinoma of the appendix, when it was very evidently an instance of primary carcinoma of the cæcum.

Leichtenstern,⁵ in 1876, briefly mentioned statistically the observation of three carcinomata of the appendix. No mention, however, of the character of the neoplasms was made other than that they were carcinomata.

Bierhoff,⁶ in 1880, reported a case of a woman of seventy-eight years who presented at autopsy carcinoma of the uterus and left ovary, as well as of the rectum, with metastatic nodules in the liver and spleen. The appendix was normal for three centimetres of the proximal portion. Three centimetres from the base was situated a carcinomatous nodule the size of a hazel-nut. This nodule produced an obstruction of the lumen such that the distal portion of the appendix was distended into a tense sac containing a grayish mucoid material. This case is here referred to because it, too, has been frequently quoted as an instance of primary carcinoma of the appendix, while in all probability the involvement of the appendix was secondary.

Beger,⁷ in 1882, reported a case of considerable interest. The patient, a man of forty-seven years, developed three and one-half years previously a tumor in the right inguinal region, which was incised and about a litre of pus evacuated. The wound, however, never closed. No faecal gases or intestinal contents appear to have escaped through the fistula. At operation the appendix was found attached by its tip to the base of the fistula, and occupied throughout its entire extent by a carcinomatous process. It was six centimetres in length and about the thickness of the finger. At the base of the appendix was a walnut-sized papillary tumor projecting into the cæcum, which presented the same structure as the rest of the new growth, and had evidently resulted from extension along the appendix. The patient died thirty-six hours after the operation, and at autopsy metastatic involvement of the retroperitoneal glands was found. Microscopical examination of the new growth showed it to be an adenocarcinoma. The writer believed the carcinoma to have begun at the tip and to have gradually extended to the base of the appendix. The case was of especial interest because of the absence of intestinal symptoms in spite of the existence of the tumor for so long a time.

Maydl,⁸ in 1883, mentions one case of carcinoma of the appendix in an article upon intestinal carcinoma. No further men-

tion was made, however, of the gross or microscopical appearances of the tumor.

Draper,⁹ in 1884, reported a case of a man of sixty-five years who died with obscure abdominal symptoms which did not allow of a clinical diagnosis. At autopsy the ileum above the ileocaecal valve was distended with liquid fæces. Just at the valve, upon its upper surface, three foreign bodies—two small fragments of bone and a prune-stone—were found lying loosely before the opening into the cæcum. The valve was constricted so as to admit the tip of the index-finger only with difficulty. The mucous membrane of the cæcum and lower part of the ascending colon was thickened and deeply reddened, but not ulcerated. The upper third or head of the appendix was enlarged and dilated to about the size of a large plum. The opening of the appendix into the intestine was also dilated. The thickened wall of this enlarged portion of the appendix presented the characteristic appearances of colloid disease. The free end of the appendix beyond the dilated portion was very slightly enlarged and contained inspissated faecal matter. The peritoneum and subperitoneal tissues adjacent to the new growth were normal.

In this case there would appear to be a reasonable question as to whether the neoplasm may not have been primary about the ileocaecal valve and to have involved the appendix secondarily.

Lafforgue,¹⁰ in 1893, presented an interesting thesis upon primary tumors of the appendix in which several cases in the literature were discussed and the clinical features of the disease were presented. The writer did not, however, report any additional cases.

Glazebrook,¹¹ in 1895, reported a case of so-called endothelial sarcoma of the appendix, which, because of the as yet unsettled relationship of these tumors to carcinoma, will be briefly referred to. The patient, a man of fifty-five years, died of cerebral hæmorrhage. At autopsy the appendix was in a normal situation, but bound down by dense adhesions. It was of normal size for three inches from the proximal end, at which point there was an enlargement the size and shape of a pigeon's egg, situated in the anterior wall of the appendix. The mass was hard and fibrous and resembled a scirrhus tumor. After microscopical examination, the tumor was said to be an endothelial sarcoma, the walls of the appendix being infiltrated by nests of irregular cuboidal or

cylindrical cells which were thought to be of endothelial origin. There were no evidences of metastases.

Stimson,¹² in 1896, reported a case of carcinoma of the appendix in a woman forty-four years of age, who had had a very severe attack of appendicitis ten years previously. She remained well until two months before operation, when she had a mild attack and recovered. Another mild attack led to an operation and the removal of the appendix, which was four inches in length and one inch in thickness, and presented a degenerated carcinoma, the type of which was not mentioned.

Letulle and Weinberg,¹³ in 1897, presented a brief discussion of the subject of obliterating appendicitis, based upon the study of twelve cases, two of which presented primary carcinomata of the appendix. They called especial attention to the development of carcinoma in the fibrous cicatrix of an obliterated appendix and the involvement of all the layers of the appendix by the carcinoma. In one of their cases, both of which occurred in individuals dead of tuberculosis, they were able to demonstrate the starting-point of the carcinoma at the line of fusion where the lumen had been obliterated. In this case the carcinoma had extended from this point through the different layers to the peritoneum. In the second case the terminal extremity of the appendix was the seat of a peculiar adenomatous hypertrophy. The carcinoma had begun in the scar and had involved all the coats of the appendix.

Mossé and Daunic,¹⁴ in 1897, reported a case of primary carcinoma of the appendix, found at autopsy upon a woman fifty years of age, dead of heart disease. There had been, so far as was known, no symptoms of appendicular disease. The appendix pointed downward and inward, was free from adhesions, and was provided with a normal-looking mesentery. It was four centimetres in length and much thicker than normal, having a maximum circumference of forty-five millimetres, cylindrical in shape, about the size of a date and largest at its free extremity. The consistency was firm and the surface smooth. The tumor was entirely confined to the appendix, and was situated for the most part in the mucosa, and in the centre of the growth was the lumen, which was much reduced in size. The mucosa was quite extensively invaded, the musculature less so, while the peritoneum appeared to be uninvolved. In the vicinity of the lumen vestiges

of the glands of Lieberkühn could be made out, some of which had undergone carcinomatous degeneration and seemed to have been the starting-point of the tumor. In portions of the section the tumor presented the appearance of a cylindrical-cell carcinoma, while in other portions it presented more of an alveolar arrangement. The absence of foci in the cæcum, lymphatic glands, and the other viscera led the writer to assume the tumor to be a primary carcinoma of the appendix.

Wright,¹⁵ in 1898, reported an autopsy upon a case of general peritonitis of obscure origin. The autopsy failed to reveal any definite starting-point of the peritonitis. There were some adhesions about the appendix, but no definite evidence of perforation. Upon microscopical examination of the appendix a small primary carcinoma of the head of the organ was found, and just at the junction of the tumor with the wall of the gut was a small perforation which was doubtless the starting-point of the peritonitis. The tumor presented the microscopical appearances of a typical adenocarcinoma.

Monks,¹⁶ in 1899, reported a case of tumor involving the cæcum, in the middle of which there was a slough which seemed to represent the appendix. The tumor proved to be a carcinoma and was undoubtedly primary in the cæcum, with possibly secondary involvement of the appendix. Reference is made to this case because it has been erroneously quoted as an instance of primary carcinoma of the appendix.

Nothnagel,¹⁷ in 1898, briefly mentioned one case of carcinoma of the appendix observed in the Pathological Institute of the general hospital at Vienna. There was, however, no discussion of the characteristics of the case.

Zeman, of Vienna, has also mentioned statistically a case of carcinoma of the appendix, which, however, may be a case already referred to.

Hurdon,¹⁸ in 1900, reported a case of a woman of twenty-four years, who, since the birth of her first child eight years previously, had had considerable pain in the lower abdomen and back, associated latterly with a constant aching in the right lumbar region. The uterus was found to be acutely retroflexed and operation advised. At operation the appendix was found to project downward over the brim of the pelvis and to be involved in dense adhesions. The appendix was removed, and the patient made a

good recovery. The appendix, which was ten centimetres in length, was found to be acutely flexed upon itself at about the junction of the middle and distal thirds. The proximal end was normal, but the distal end beyond the flexion was distended, and contained a soft concretion about the size of a date-stone. Joining the distended extremity to the normal proximal portion was an intermediary portion one and one-half centimetres in length, and of very firm consistence. This on section was found to be a small oval tumor ten by five millimetres, which had produced a marked stenosis of the lumen. Histologically, the tumor proved to be an adenocarcinoma which had invaded all the coats of the appendix. The patient was in excellent health at the time the report was made.

Letulle and Weinberg,¹⁹ in a communication to the Anatomical Society of Paris in 1900, reported two additional cases of primary carcinoma of the appendix complicating chronic appendicitis. In the first case the carcinoma was discovered more or less accidentally in the course of an autopsy upon an individual who had died of tuberculosis. The second case was a child of twelve years of age operated upon by Jalaguier. The patient had had several attacks of appendicitis. The carcinoma, which was of the adenomatous type, was located at a point of the appendix at which a stenosis had resulted from the chronic inflammatory process. The rest of the appendix presented the usual appearance of acute appendicitis. The patient made a good recovery.

Giscard,²⁰ in 1900, reported a case of a man of thirty-seven years who in March, 1898, had his first attack, which was mild in character. In October of the same year he had a second attack, and after several days developed grave symptoms, which led to an operation. An abscess of the right iliac fossa was found with local peritonitis. The appendix was situated behind and to the inside of the cæcum. The patient made a good recovery. The appendix was about the size of a crayon of chalk, and the lumen was obstructed at about the middle of the organ by what appeared to be a cicatricial thickening. In the distal end of the appendix there was some pus. Histological examination of the appendix showed both a catarrhal and chronic inflammation. At one point the sections also showed a narrowing of the lumen by a neoplasm situated between the mucosa and musculature. This growth occupied about one-half of the circumference of the appendix, and

caused a projection towards the lumen as well as towards the periphery. The carcinoma seemed to originate from the deeper layer of the glands, and in its superficial portion presented the characteristics of an adenocarcinoma, while in the deeper portion it resembled an alveolar carcinoma with cylindrical cells.

Rolleston,²¹ in 1900, reported a case of a woman twenty-six years of age, operated upon during a fourth attack of appendicitis, the previous three attacks having occurred within a period of fifteen months. The appendix was slightly adherent to the posterior wall of the uterus, and on section presented a globular mass a little larger than a marble, and situated near the tip. This mass presented a caseous appearance which suggested tuberculosis. Histologically, it proved to be a spheroidal-cell carcinoma, which in places appeared to extend almost to the peritoneum. The growth was undoubtedly primary in the mucosa. Several months after the operation the patient was reported to be in poor health, and the probability of secondary growths was entertained.

Whipham,²² in 1901, reported a case of a woman of forty-five years who was admitted to St. George's Hospital with great enlargement of the abdomen and a tumor in the left iliac fossa. Operation was deemed inadvisable, and the patient died four weeks later. At autopsy the abdomen was found to contain a large quantity of serous fluid. The peritoneum over both the parietes and viscera was thickly studded with nodules of new growth. One or two nodules were found in the liver, and the left ovary was transformed into a mass of new growth measuring six by four inches. The lymphatic glands of the neck and anterior mediastinum were also involved. The mucous membrane of the entire alimentary tract was normal, with the exception of a small portion at the base of the appendix, which was occupied by a new growth. The neoplasm proved to be a spheroidal-cell carcinoma. The writer assumed the neoplasm to be primary in the appendix because of the absence of new growths elsewhere in the alimentary tract, and also because the growth was most marked in the mucosa and submucosa, and invaded the muscular coats of the appendix but slightly. The reasons for the assumption that this was a primary carcinoma of the appendix do not appear to be by any means valid, and it is much more probable that the growth originated in the left ovary and metastasized to the appendix.

McBurney,²³ in 1901, reported two cases of primary carcinoma of the appendix. The first was a case of a woman twenty-three years of age, who had had a severe attack of appendicitis two years previously. The symptoms subsided in ten days, and the patient remained well except for a feeling of pain and discomfort in the right iliac fossa on movement or active exercise. Two months before operation the pain became very severe and incapacitated the patient, without rise of temperature or pulse. On examination the patient appeared to be in good health, but the appendix was very sensitive. At operation the appendix was found free from adhesions or disturbance of the peritoneal surface. The organ was four inches in length, much thickened and enlarged, and presented two strictures, one near the base and one near the tip. Near the tip was a small tumor about the size of a green pea, of dense consistency and white color, which microscopically proved to be a pure carcinoma. There was no evidence of malignant disease elsewhere in the body. The second case was of a man of about thirty years who had given no history of appendicitis. At autopsy the appendix was found to present a rounded tumor near the tip. This tumor was considerably larger than that in the first case, and microscopically was found to be a pure carcinoma resembling the first specimen.

Goffe,²⁴ in 1901, reported a case of a Jewess of fifteen years, well developed and well nourished, who for more than a year had complained of pain in the region of the appendix after exercise. A clinical diagnosis of chronic appendicitis was made and the organ removed. The appendix was unusually long, thickened, and tortuous, and in the extreme tip was a small white tumor the size of a large pea. Microscopically, the tumor resembled a fibroma, and appeared to have developed in the wall of the appendix and protruded into the lumen. Histologically, it was found to be a carcinoma, which did not, however, invade the muscular coats.

Kelly,²⁵ in 1901, reported three cases of primary carcinoma and one case of primary endothelioma of the appendix. In the first case the appendix presented the usual character of acute ulcerative appendicitis. At about the junction of the middle and distal thirds was a tumor six millimetres in diameter, occupying chiefly the mucosa and submucosa, and microscopically of the type of carcinoma simplex. The second case was that of an indi-

vidual twenty-four years of age, with a history of four attacks of appendicitis in the year previous to operation. At operation the appendix was free from adhesions, nine centimetres in length and from five to seven millimetres in diameter. There was no macroscopical evidence of tumor formation; microscopically, however, there was an area near the base of the organ which presented an appearance which the writer considered to be endothelioma. The description of the specimen, together with the uncertain position of this group of tumors, leaves some doubt as to whether this may not have been a case of carcinoma rather than endothelioma. The third case was that of a man of nineteen years who had always been strong and well. Eight days before admission to the hospital he had been taken with severe abdominal pain, which localized itself in the right iliac fossa, where a mass about three inches in diameter could be felt. At operation a collection of pus was found around the head of the cæcum and the base of the appendix. The appendix was five centimetres in length and one centimetre in diameter. Histologically, the organ presented the lesions of ulcerative appendicitis, in addition to which there was a small growth situated near the base of the appendix. The growth, which was of the type of carcinoma simplex, was located almost entirely within the submucosa, although in a few places there was a slight infiltration of the muscular coats. The fourth case was of a man of sixty-three years, who had always been well until a short time before admission to the hospital, when he began to have attacks of rather severe pain in the right iliac fossa. At operation the appendix was found to be adherent to the surrounding structures, and both the appendix and intestines were studded with numerous whitish nodules suggestive of miliary tubercles. The retroperitoneal glands were also enlarged. The patient died seven days after operation, but no autopsy was obtained. The appendix was two centimetres in length and varied in diameter from one to two centimetres. It presented a constriction at about the middle. Microscopically, the lumen was obliterated, and there was no evidence of a mucous membrane in any part of the organ. The submucosa, muscularis, and peritoneum were infiltrated with nests of carcinoma cells. The meso-appendix was similarly infiltrated. The writer suggests the possibility that the appendix was involved secondarily to carcinoma somewhere else in the body; but the absence of the mucosa and the arrangement of the car-

cinoma cells inclined him to the view that the growth was primary in the appendix. In view of the fact, however, that there was general peritoneal involvement which was also evident upon the surface of the appendix, together with involvement of the retro-peritoneal glands, it would seem very much more probable that the growth in the appendix was secondary to a neoplasm elsewhere in the body.

Harte and Willson,²⁶ in 1902, have reported two cases of primary carcinoma of the appendix. The first case was of a woman of twenty-four years, who at the age of nineteen had an attack of what appeared to be appendicitis, from which she recovered and remained well for four years, when she had another attack. For several months prior to the operation she had had more or less pain in the region of the appendix. On physical examination there was abnormal sensitiveness in the right iliac fossa and some thickening of the tissues about the appendix. At operation the appendix was found to be free from adhesions and to project upward behind the cæcum. It was fifteen centimetres in length, contained two small concretions, and appeared normal to the naked eye. The lumen was, however, obliterated for almost the entire length of the organ. On physical examination a scirrhous carcinoma five millimetres in diameter was found about one centimetre from the tip. The carcinoma appeared to have originated from the remains of the glands of the mucosa and to have invaded all the coats of the appendix. The second case was of a man of twenty-five years, who for eight months prior to the operation had had more or less continuous pain in the right iliac fossa. The appendix was found to be bound down behind the cæcum by old adhesions. It contained a concretion about the size of a grape-seed and presented a perforation near the tip. Sections of the appendix about one centimetre from the tip showed a carcinoma taking its origin from the mucosa. All the coats of the appendix were involved in the growth, which was a carcinoma simplex in type. In addition, the appendix presented the gross and microscopical appearance of acute suppurative appendicitis.

Weir,²⁷ in a discussion of primary carcinoma of the appendix at the meeting of the American Surgical Association in 1902, briefly reported one case which had occurred in his practice. There was, however, no description of the gross or microscopical appearance of the tumor.

Jessup,²⁸ in 1902, reported a case of a woman of thirty-six years who had had considerable pain in the left inguinal region following an abortion. Operation was undertaken by Dr. Cleveland for disease of the uterine adnexa. A cyst of one ovary was found, and the appendix, which was bound down by adhesions, was removed. The appendix was six centimetres in length, and at the junction of the middle and distal thirds was bent at a right angle, with a constriction at the bend, beyond which was an enlargement. The diameter of this portion was one centimetre while that of the proximal portion was five millimetres. The lumen was obliterated at the bend, and the enlarged portion was occupied by a firm tumor mass, the muscular coat presenting a thin shell. Microscopical examination showed the tumor to be an adenocarcinoma which had infiltrated the mucosa, submucosa, and muscularis. The middle and proximal portions of the organ were free from new growth. There had been no symptoms pointing to disease of the appendix, and the discovery of the carcinoma was accidental.

Of the forty cases here referred to, it would appear that eight were probably not cases of primary carcinoma of the appendix. These eight comprise one case of Merling, one case of Prus, one case of Kolaczek, one case of Bierhoff, one case of Draper, one case of Monks, one case of Whipham, and one case of Kelly. To these eight cases may be added the case reported by Glazebrook as endothelial sarcoma and one reported by Kelly as endothelioma; although it would seem, from the description, that these may have been instances of primary carcinoma of the appendix. Of the remaining thirty cases there may be some question as to the authenticity of the four cases reported by Rokitsansky, the three cases reported by Leichtenstern, the case reported by Maydl, the case reported by Nothnagel, and the case reported by Zeman, because in none of these cases was there a report of a microscopical examination or of positive proof that if a carcinoma existed it was necessarily primary in the appendix.

The remaining twenty cases would, however, appear to be fairly definitely proven to be instances of primary carcinoma

of the appendix. The macroscopical findings in these twenty cases are furthermore confirmed by more or less extensive descriptions of the microscopical characters of the neoplasms. These twenty cases comprise one case of Beger, one case of Stimson, one case of Mossé and Daunic, one case of Wright, one case of Hurdon, four cases of Letulle and Weinberg, one case of Giscard, one case of Rolleston, two cases of McBurney, two cases of Harte and Willson, one case of Goffe, two cases of Kelly, one case of Weir, and one case of Jessup.

To these the writer wishes to add the following three cases recently studied by himself.

CASE I, Figs. 1, 2, and 3.—W. D., male, aged eighty-one years, a patient of Dr. Vander Veer. The patient had always been strong and healthy until during the later years of life, when he had shown evidence of both pulmonary and cardiac disease, which were the immediate cause of death. There had never been any symptoms of disease of the appendix. At autopsy, the main lesions were pulmonary tuberculosis with pleural effusion upon the right side, general arterial sclerosis with hypertrophy and dilatation of the heart, chronic interstitial nephritis, and a primary neoplasm of the vermiform appendix. The appendix projected upward behind the cæcum, was free from adhesions, and measured five and one-half centimetres in length. The proximal two centimetres of the organ was of normal appearance and measured six millimetres in diameter. The distal three and one-half centimetres of the appendix was much enlarged and measured three centimetres in diameter. Projecting from the convex surface of the enlarged portion of the appendix at about the middle of the surface, opposite the mesenteric attachment, was a mass of yellowish-green, translucent, gelatinous material. This mass measured two and one-half by two and one-half by two centimetres in its diameters, and presented an irregular contour. On transverse section of the appendix through the middle of the enlarged portion, the lumen of the organ was found to be filled with a gelatinous substance resembling that already mentioned. At about the middle of the convex surface of the enlarged portion of the appendix and opposite the mesenteric attachment was a perforation one centimetre in diameter, through which the gelatinous



FIG. 1.—Case I., primary colloid carcinoma of appendix. Showing the projection of the colloid material through a perforation of the organ. (Natural size.)

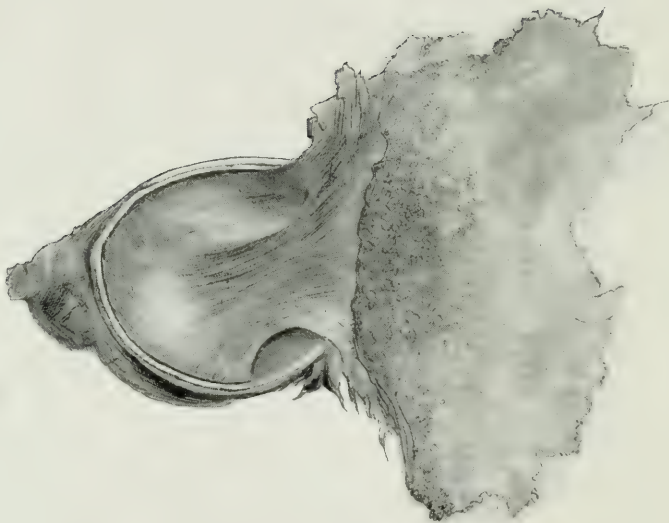


FIG. 2.—Case I., primary colloid carcinoma of appendix. Transverse section through the appendix in the region of the perforation. (Natural size.)

material in the lumen of the organ was continuous with that already described as attached to the surface. The perforation was definitely circumscribed and the edges were rather firm. There was no evidence of necrosis of the tissue about the perforation. The gelatinous substance within the appendix presented a striated appearance, the striæ tending to converge towards the perforation. This gelatinous material could be readily detached from the wall of the appendix, and in places presented a decidedly lamellated appearance in addition to the striation already mentioned, and the consistence was about that of calves'-foot jelly. The wall of the appendix, except in the region of the perforation, appeared distinctly thickened, and presented the appearance of an hypertrophy of the musculature. Careful examination of all the other viscera of the body, as well as of the regionary lymphatic glands, failed to reveal any other focus of new growth.

Microscopical examination of sections stained in hæmatoxylin and eosin, as well as van Gieson's stain, did not reveal in any portion of the dilated appendix any evidence of the mucosa. This appeared to be mainly due to an atrophy of the mucosa, resulting from the pressure of the contents of the organ and to a much lesser extent to a destruction of the mucosa by a new growth, which in places could be seen invading both the submucosa and the musculature, but nowhere invading the deeper layers of the musculature or peritoneum, except in the vicinity of the perforation. The new growth presented the typical appearance of an adenocarcinoma, which, however, was evident only in the most recent portions of the growth, and was in no place at all abundant. The new growth was composed of glandular structures which were closely arranged, with but very little stroma. The glands were lined by a high columnar epithelium, the protoplasm of which stained well. In the most recent portions of the growth there was but little evidence of the gelatinous material; but as one traced the glandular structures into the older portions, the columnar epithelial cells became much elongated and the protoplasm stained faintly. The limiting membrane of certain of the cells appeared to have burst, and the contents were extruded into the lumen of the gland. The nuclei of the cells stained less deeply, and began to show slight evidences of fragmentation and disintegration. Gradually the cells became transformed into the gelatinous material, until in older portions of the tumor the indi-

vidual cells could no longer be distinguished and the nuclei, fragmented and disintegrated, were scattered in an irregular row along the few strands of stroma, while practically the entire gland spaces were occupied by the gelatinous material. Still older portions of the new growth, which to the naked eye appeared to be composed almost entirely of gelatinous material, presented somewhat of a lamellated appearance, the lamellæ being composed of the gelatinous material, while between the lamellæ vestiges of the stroma could be distinguished, associated with which were bits of the fragmented nuclei of the tumor cells. In the oldest portions of the tumor these lamellæ were closely packed together; the result, evidently, of pressure caused by the constant production of the material by the new growth. Between these lamellæ, which corresponded to the much altered gland spaces, the stroma could no longer be distinguished and the fragmented nuclei had entirely disappeared. In the place of the stroma and fragmented nuclei there was a small quantity of rather granular material, which stained deeply with eosin and was probably hyaline in character. The new growth appeared to be fairly well localized in the region of the perforation and did not involve the wall of the appendix at all extensively. Inasmuch, therefore, as there was no evidence of the neoplasm in other parts of the body, the conclusion would seem to be justified that this was a case of primary adenocarcinoma of the appendix belonging to the type which is usually known as colloid carcinoma.

CASE II, Fig. 4.—Mrs. L., aged thirty-six years, a patient of Dr. Macdonald. The patient had always enjoyed good health until about eight years previously, when she had an attack of what was called "peritonitis," from which she made a fairly good recovery, and had enjoyed good health until a short time before the operation, when she developed symptoms of pelvic disease. The patient had never manifested any evidence of disease of the appendix. At the operation a cyst of the right ovary was found associated with rather extensive pelvic inflammatory disease, for which bilateral salpingo-oophorectomy was done. The appendix was free from adhesions and did not present any definite evidence of disease, but was removed in the course of the operation. The patient made an uneventful recovery, and has remained in perfect health ever since, the operation having been done in 1900.

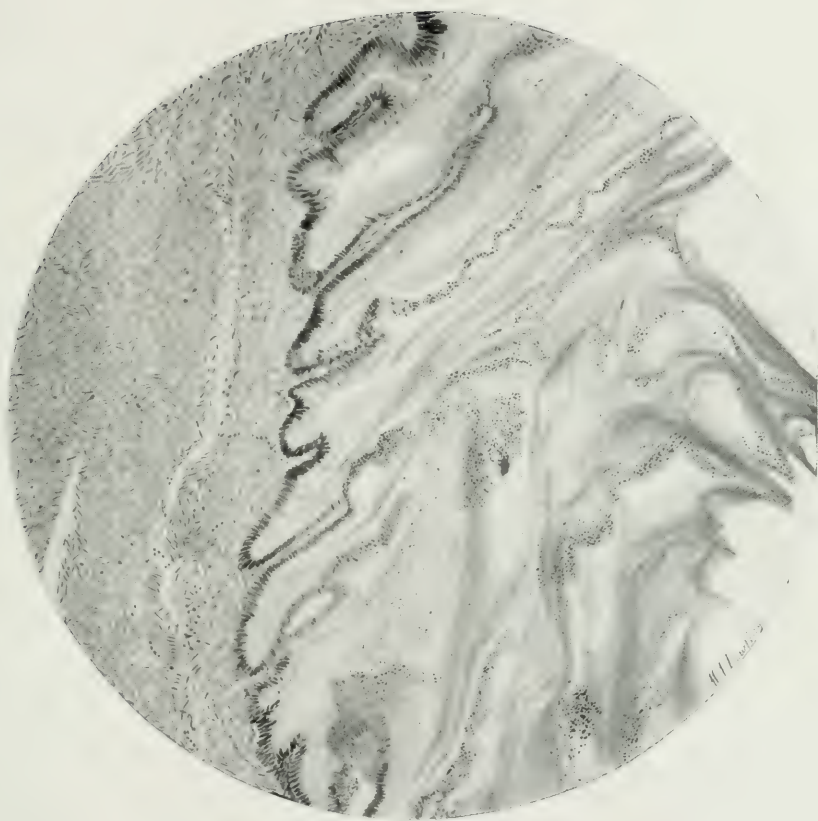


FIG. 3.—Case 1., primary colloid carcinoma of appendix.

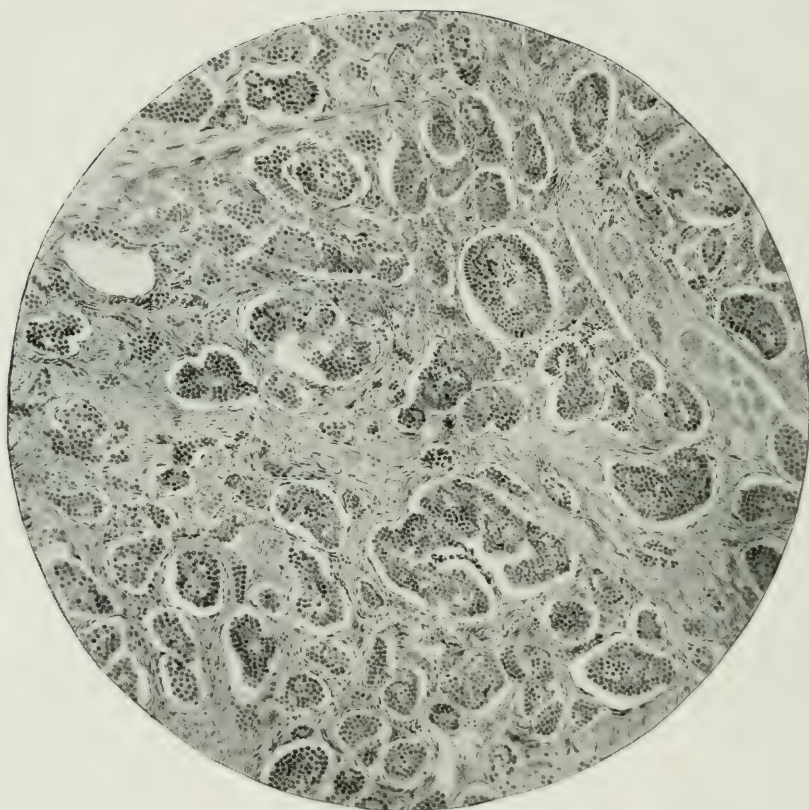


FIG. 4.—Case II., primary carcinoma of an obliterated appendix.

The appendix measured four centimetres in length and ranged from six to nine millimetres in diameter. The mesentery, which contained a considerable amount of fat, extended to the tip; the peritoneum was smooth and glistening; the vessels, however, were somewhat congested. Situated about one centimetre from the proximal end of the appendix was a slight enlargement which extended for about eight millimetres. It was in this region that the organ presented the greatest transverse diameter. The consistency of this portion resembled that of the rest of the appendix, which was decidedly firm. The lumen was completely obliterated throughout the entire organ. Transverse section of the base and tip of the appendix showed the lumen to be obliterated by a white reticulated tissue, in the meshes of which collections of fat could be seen. The muscular coat appeared to be normal.

Section through the enlargement already referred to showed the central portion of the organ to be occupied by a more homogeneous tissue, which in the specimen hardened in Orth's fluid presented a slight yellowish tinge. This tissue appeared to extend into the musculature, especially upon the side of the mesenteric attachment. Microscopical examination of sections through the proximal and distal portions of the appendix stained in hæmatoxylin and eosin showed the usual appearance of chronic obliterative appendicitis. The lumen could not be distinguished, and its place, as well as that of the mucosa, was occupied by rather loose connective tissue continuous with the submucosa. No vestiges of the mucosa, glandular structures, or lymphoid apparatus of the appendix could be distinguished. The muscular coats were somewhat thickened and hypertrophied, and the peritoneum was also slightly thickened. In sections through the enlargement of the appendix already mentioned the central portion of the organ was found to be rather densely infiltrated with a new growth, which involved to a lesser extent the musculature and peritoneum. The growth was characterized by numerous large and small alveoli occupied by cells, the outlines of which could be distinguished with difficulty, but which appeared to be for the most part cuboidal or polygonal in shape. These cells contained rather large round or oval nuclei, most of which stained well in the hæmatoxylin, but some of which were rather vesicular in character. The cells and nuclei appeared to be of fairly uniform size, and in most of

the alveoli were densely packed together. Some of the alveoli were so small as to present only three or four cells in transverse section. In many of the larger alveoli the process of fixing and hardening the tissue had caused the cells to shrink away *en masse* from the connective-tissue stroma, leaving a clear space. In certain of the alveoli a distinct lumen could be distinguished surrounded by one or two rows of cuboidal cells. Some of the larger alveoli contained a considerable number of red blood-corpuscles which may have found their way there either from trauma at the time of the operation or from invasion of the blood-vessels by the new growth, which in some places was quite evident. The protoplasm of the cells in some of the alveoli presented a small amount of rather diffuse yellowish-brown pigment. The outer or longitudinal layer of muscle appeared to be more extensively involved than the inner or circular layer, and both layers were most extensively involved on the side of the mesenteric attachment. The peritoneum, which was decidedly thickened, also presented numerous alveoli of tumor cells. The tumor was not circumscribed, but appeared to extend rather diffusely through the structures of the appendix, and appeared in places to extend along the blood and lymph channels. In general, the tumor appeared to be epithelial in character, although there were certain portions of it in which an endothelioma of blood-vascular origin was strongly suggested. It is our belief, however, from a careful study of many sections, that the tumor was a carcinoma of a somewhat alveolar type, and was undoubtedly primary in the appendix.

CASE III.—F. C., male, aged nineteen years, a patient of Dr. Macdonald, was admitted to the Albany Hospital, June 9, 1902, complaining of general abdominal pain. The family history was negative, as was the patient's past history. He had always been strong and healthy until the onset of the present illness.

The present illness began in January, 1902, with an attack of acute appendicitis, which was associated with the formation of an indurated mass in the right iliac fossa, in which after a short time an abscess formed, which opened externally in the right lower quadrant of the abdomen. The sinus still existed when the patient was admitted to the hospital. The tumor mass on the right side never disappeared, and the discharge from the sinus was fairly continuous. The patient had lost forty pounds in weight. There were no symptoms associated with the fistula

which suggested a communication with the bowel. No diarrhoea, but at times constipation. The patient had had more or less continuous pain in the right iliac fossa for several months prior to admission to the hospital. The fæces had never shown any abnormal appearance.

On admission the patient presented a well-marked tumor mass in the right iliac fossa, the size of a large fist. This mass was tender on palpation, and from the sinus there was a purulent discharge. A clinical diagnosis of tuberculosis of the head of the cæcum was made. The patient was operated upon June 11, 1902.

At operation the mass in the right iliac fossa was found to be composed of a new growth involving the appendix, cæcum, ileum, the ascending and a portion of the transverse colon, as well as a loop of the jejunum. All of the involved parts were adherent in a mass. It was found necessary to remove the entire cæcum with the remains of the appendix, and about eleven centimetres of the ileum and ascending, as well as of a portion of the transverse colon, and about eighteen centimetres of the jejunum. The appendix was almost entirely destroyed, and the lumen of the proximal portion opened freely into an abscess cavity the size of a small hen's egg, which contained and was lined by necrotic material, and which communicated with the fistula which opened upon the surface of the abdomen. The appendix and the tissues immediately surrounding it appeared to be the oldest portions of the new growth. There was also extensive involvement of the regional lymphatic glands, which were removed so far as possible. The severed ends of the jejunum were united by a Murphy button with secondary Lembert sutures. The end of the transverse colon was closed, while the end of the ileum was brought out into the wound. The patient did fairly well for about two weeks, when he began to grow weaker, and died of inanition.

The specimen removed at operation consisted of the cæcum, the remains of the appendix, about eleven centimetres of the ileum, the ascending and a portion of the transverse colon, and some enlarged lymphatic glands in one mass, while in a separate mass were about eighteen centimetres of the jejunum. The distal portion of the appendix was entirely destroyed, while the proximal two centimetres of the organ could still be distinguished. The lumen opened freely into a small cavity two and one-half

centimetres in diameter, situated between the ileum and the cæcum. This cavity was located in the mass of new growth, which appeared to correspond to the distal portion of the appendix, and which seemed to be the oldest portion of the tumor. The lumen of the appendix opened freely into the cæcum as well as into the small cavity already described. To this mass of new growth the lower portion of the ileum as well as the ascending and transverse colon were adherent, and were apparently extensively involved. The growth had caused an ulceration through the wall of the ileum as well as of the transverse colon, both of which perforations opened into the cavity already referred to. The new growth was very much more extensive in the peritoneal and muscular coats of the involved bowel than in the mucosa, and it seemed apparent that the adherent intestines had become involved secondarily. The new growth was of rather soft consistence, and on section of a grayish-white color, and appeared to be largely composed of a gelatinous translucent material resembling colloid. In portions of the tumor there was also marked necrosis and softening. The gelatinous material was contained in more or less definite spaces, separated by bands of connective tissue. The lymphatic glands were much enlarged and diffusely involved by the new growth, which presented extensive colloid degeneration.

Microscopical examination of sections through the base of the appendix stained in hæmatoxylin and eosin showed a decided thickening of all the coats of the organ, due to a diffuse infiltration by a new growth. The lumen contained a small amount of necrotic material. The lining epithelium had disappeared, but certain of the glands as well as some of the lymphoid tissue of the mucosa could still be distinguished. The new growth was for the most part of a somewhat glandular type and presented larger and smaller alveoli, which in the more recent portions of the growth were occupied by irregular shaped cells, most of which were cuboidal or polygonal in shape. In some of the alveoli a definite lumen could be distinguished, while in others none could be seen, and the entire alveolus was packed with epithelial cells. In some of the places there was a slight resemblance between the glands of the mucosa and the more recent portions of the growth. In certain portions the tumor was composed simply of narrow columns of epithelial cells, suggesting the appearance seen in carcinoma simplex. In older portions of the growth the alveoli

were much larger, and the epithelial cells were grouped along the periphery of the alveolus, while the central portion was occupied by a homogeneous substance which stained very faintly with hæmatoxylin, and which presented a marked reticulated appearance, and in which an occasional degenerated epithelial cell or nucleus could be seen. In still older portions of the growth several alveoli had apparently fused, and the intervening stroma as well as the fixed tissue in general had largely disappeared. Most of the epithelial cells had degenerated, and the alveoli were filled with colloid material, scattered through which were occasional more or less degenerated epithelial cells and free nuclei. The colloid material first appeared as small refractile globules in the protoplasm of the tumor cells. These globules enlarged and became fused, as a result of which practically the entire cell came to be occupied by the colloid material, which stained very faintly with hæmatoxylin. The nucleus of the cell either entirely disappeared or was pushed off to one side of the cell, presenting the signet-ring appearance. The cell membrane in many instances appeared to remain intact, but sooner or later ruptured, and the colloid material became fused with that resulting from the degeneration of neighboring cells. In the oldest portions of the tumor practically all the cells had undergone the colloid degeneration, and the alveoli were occupied simply by the colloid material without, in many instances, a single distinguishable epithelial cell or nucleus. These alveoli showed a marked tendency to fuse, thus giving rise to extensive areas of colloid material. The colloid substance presented a markedly reticulated appearance, part of which seemed to be due to the preservation of more or less of the cell membrane as well as some of the intervening stroma. There were, however, in the oldest portions of the tumor but comparatively little stroma and very few blood-vessels. The lymphatic glands were diffusely infiltrated with the new growth, and only a small zone of the lymphoid tissue remained immediately beneath the capsule. The colloid degeneration was even more marked in the lymphatic glands than in the tumor itself, and practically all of the new growth appeared to have undergone this degeneration.

From a careful, clinical, anatomical, as well as pathological investigation of this case, we feel justified in assuming that it was a primary colloid carcinoma of the appendix of an adenomatous type, with extensive secondary involvement of the neigh-

boring portions of the intestines, as well as the regional lymphatic glands.

The early view was that carcinoma of the appendix was not primary, but resulted from extension from some neighboring organ. On the contrary, recent investigation has shown that primary carcinoma of the appendix is of more frequent occurrence than is ordinarily supposed, while secondary tumors of the appendix are of rare occurrence, even though the cæcum may be extensively involved.

Regarding the etiology of carcinoma of the appendix comparatively little is known, although recent studies have shown that in some instances, at least, it is one of the sequelæ of chronic inflammation of that organ. Theoretically, the appendix should frequently be the site of carcinoma, because certain factors which are usually supposed to bear an important causal relationship to the development of neoplasms are in evidence in this organ. In the first place, carcinoma of the gastro-intestinal tract tends to originate at those portions which are narrow or constricted, which is one of the characteristics of the appendix. Secondly, foetal remains as well as atrophying organs appear to be more prone to the development of carcinoma, and such a condition is supplied by the appendix. Thirdly, mechanical irritation, which is such an important factor in the development of certain neoplasms, exists extremely frequently in the appendix, and usually results from the action of enteroliths, dried faecal matter, and occasionally foreign bodies. When one considers the great frequency with which gall-stones are followed by the development of carcinoma of the gall-bladder or bile passages, it seems extremely remarkable that such a condition is not more frequently observed in the appendix. Fourthly, chronic inflammation, which in so many instances is followed by the development of neoplasms, occurs almost as frequently in the appendix as in any organ of the body. The studies of Letulle and Weinberg, Harte and Willson, and others have shown that primary carcinoma of the appendix does occasionally develop in an organ the subject of chronic inflamma-

tion, usually of the obliterative type. Of such a character is Case II reported by the writer, in which a typical carcinoma had developed in a completely obliterated appendix. It may furthermore be urged that if more careful routine examination were made of appendices removed at operation, primary carcinoma would be observed more frequently, for in many of the cases reported during the past few years the new growth has been an accidental find, the presence of which was never suspected before operation, or even, in some instances, after macroscopical examination of the organ. It is only comparatively recently that many surgeons have made a practice of having all appendices removed at operation examined by a pathologist, and this certainly accounts for the increased number of neoplasms of this type observed of late. Sections should be studied not merely from one or two portions of the organ, but from several portions, and especially in those appendices which show evidences of chronic inflammation.

A striking feature of many of the cases of primary carcinoma of the appendix reported is the development of the disease in comparatively early life.

Of the twenty-three cases in which the proof seems conclusive that the new growth was primary in the appendix, the age of the patients is stated in seventeen. Nine of these seventeen, or 53 per cent. of the patients, were under thirty years of age, while four, or 24 per cent., were under twenty years of age. The youngest case reported was that of a child of twelve years. The early age at which such a large percentage of the cases occurred may be assumed to bear a definite relationship to the age at which appendicitis is most frequent. For, as is well known, the great majority of cases of appendicitis occur in individuals under thirty years of age, and an especially large percentage of the cases are under twenty.

Carcinoma of the appendix may belong to any of the ordinary types of that neoplasm, although the colloid type appears to occur more frequently than any other. In Cases I and II reported by the writer the neoplasms were of that variety. In a considerable number of the cases reported the new growth

was confined to the appendix, and did not present any evidence of either extension or metastasis. This was very likely due to the fact that most of the tumors were removed in a comparatively early stage. The tumor may attain considerable size and may ulcerate through the wall of the appendix, and thus give rise to a local or general peritonitis. It may also give rise to a focus of suppuration, which may present the usual characters of an appendicular abscess. By local extension neighboring portions of the intestines or other viscera may become involved, and the pathological picture will depend largely upon the extent of this involvement.

In the great majority of cases the diagnosis of carcinoma of the appendix is impossible. Writers have even gone so far as to state that it is practically *always* impossible. In some of the cases there are no symptoms whatever pointing to the appendix, and the tumor is an accidental find either at operation or autopsy, as instanced by Cases I and II reported by the writer. When symptoms are present, they are usually those of appendicitis of the chronic relapsing type. In some instances the new growth may apparently cause an acute attack of appendicitis, and a perforation may result, usually at the site of the tumor. Pain is perhaps the one symptom present in the majority of the cases. This is usually referred to the right iliac fossa and may be of very varied character. When present, it differs in no way from that associated with chronic appendicitis, and hence the diagnosis is usually of that condition. The pain is usually due to the mechanical action exercised by the tumor. In the later stages a well-defined tumor mass may present in the right iliac fossa which strongly resembles an appendicular abscess. When it attains considerable size, the tumor often shows a tendency to be associated with the formation of an abscess, which may open externally, and a discharging sinus is formed which shows no disposition to heal. From such a sinus gas and faecal contents may be discharged, though this is very exceptional. The existence of such a condition with normal defecation might speak in favor of a neoplasm of the appendix. Diarrhoea and constipation, or both, may also occur in the later

stages, but they are usually due to the extension of the tumor into the neighboring intestines, and are in no sense the result of the new growth in the appendix itself.

The treatment of the condition is exclusively operative, and since the association of the new growth with the inflammatory process in that organ has come to be so well recognized, there is an added reason for the extirpation of those appendices which present evidences of either acute or chronic inflammation.

From a careful study of the subject, the following conclusions may be drawn:

1. Primary carcinoma of the appendix is not of such rare occurrence as has been hitherto supposed.

2. Every appendix removed at operation or autopsy, if it presents any evidence whatever of disease, should be examined most carefully, and sections should be made from several portions of the organ for microscopical study.

3. The relationship of primary carcinoma of the appendix to chronic appendicitis, especially of the obliterative type, seems to be fairly definitely established.

4. Primary carcinoma of the appendix shows a tendency to develop at a comparatively early period of life.

5. Primary carcinoma of the appendix does not show a marked tendency either to extension or to metastasis.

6. The symptoms of primary carcinoma of the appendix are usually the symptoms of appendicitis of the chronic type.

7. The diagnosis of primary carcinoma of the appendix is in the great majority of cases impossible.

8. The treatment of the condition should always be operative.

[The writer wishes to acknowledge his indebtedness to Dr. W. W. Sanford and Miss M. A. Dowling for the drawings published in connection with this article.]

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THE SURGICAL TREATMENT OF ANURIA.¹

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I DESIRE to present the following history of a case of anuria recently operated upon, and to discuss the subject of the surgical treatment of anuria.

E. P. H., aged twenty-three years, unmarried, entered the Presbyterian Hospital, August 1, 1902. No urine had passed for six days, the last urination having been on Saturday, July 26. The family history reveals nothing. Patient's general health has always been good, with the following exception: After twelve years of age he had occasional attacks of pain in the left kidney region. During these attacks he was obliged to lie down, when the pain would gradually subside, always within twenty-four hours. Pain was dull and "aching," and not referred.

A diagnosis of stone in the left kidney was made five years ago by Dr. Loomis and others. It was some four years ago that he had his last attack of pain in the left side. For the past five years patient says he has been aware of a "fulness" in the left lumbar region, especially behind. One year ago he had pain in the right iliac region, which was diagnosed appendicitis by a physician in Des Moines.

Present.—This summer he began again to have pain in the right side, which continued intermittently, until one day, after working very hard in the harvest-field, complete suppression of urine occurred, six days before coming to the hospital. He describes this pain as being "deep in," and locates it in the region of right kidney; also a somewhat sharper pain in the iliac region of the same side, practically over the region of the appendix. When examined by his physician, six days before admission, a fluctuating tumor was discovered in the left kidney region. Before coming to hospital, Dr. Loomis, the attending physician, had sweated the patient freely.

¹ Read before the Chicago Surgical Society, January 5, 1903.

Examination on Admission.—No urine had passed for six days. A few attacks of vomiting before coming to hospital. Consciousness is retained. Patient is a young man; well developed; well nourished. Face slightly pale. Pupils equal on the two sides, and moderately dilated. Vision is normal. No disturbance of any of the special senses. Heart and lungs appear normal.

A fluctuating tumor is situated in the left lumbar region, extending from the last rib to the crest of the ilium. It appears to be retroperitoneal, since there is tympany upon percussion over the tumor anteriorly. Distinct tenderness upon pressure over course of right ureter. Distinct rigidity of abdominal muscles, especially on right side. Upon catheterization, no urine came from the bladder. Examination otherwise negative. The patient is able to walk about; does not give the appearance of being seriously ill, and has no symptoms of uræmia.

Operation, August 1, 1902. Three hours after admission a lumbar incision was made upon the left side, over the "cystic" tumor. A large hydronephrotic sac was found and opened, when three or four pints of fluid escaped. The wall of sac was thin, showing what appeared to be a mere remnant of kidney tissue. Fluid was clear or slightly turbid, containing albumen and only a trace of urea. A rubber tube was placed in kidney pelvis for drainage, the wound being closed except at position of tube. Temperature at midnight, 101° F.; pulse, 72.

8 A.M., August 2. Large amount of blood-stained watery discharge, saturating the dressings.

Repeated examinations of fluid from the left side showed only a trace of urea, from .2 to .3 per cent. No urine from bladder.

Twenty-four hours after the first operation an incision was made down upon the right kidney, which was found enlarged to about twice its normal size. An incision was made through its convex border into the pelvis of the kidney. Kidney tissue very thick in spite of the distention. Eight or ten ounces of urinous fluid escaped through the kidney wound. No stone could be felt. A tube was placed for drainage, as upon the opposite side, and covered with a large dry dressing.

Temperature was between 99° and 100° F. until 8 P.M., August 4, when it reached 102.8° F. Three days later it was again normal, and remained between 98° and 100° F., nearly

always normal, until the third operation, on October 11, 1902. Fluid from right side contained from 1.5 to 2 per cent. of urea.

Copious dry dressings were changed several times daily after operations on August 1 and 2, dressings being weighed before being applied, and immediately after removal, to learn approximately the amount of urine being secreted.

August 3. About twenty ounces in dressings over right side. Twenty to forty ounces was the average daily quantity in the weighed dressings until the third operation, October 11, 1902. No urine was voided from bladder until August 11, ten days after operation, and then only 45 cubic centimetres, as shown by the urinary chart. (See summary of urinary record.)

August 12. Methylene blue, three grains, given by mouth. Dressings over right side showed blue stain in forty minutes. No blue staining on left side.

On returning from my vacation early in October, I found the patient in most excellent health, although he was passing almost all his urine through the right lumbar wound. I decided to operate and find and remove, if possible, the cause of obstruction, which I believed existed in the right ureter.

Operation, October 11, 1902. Incision made at site of the former operation upon the right kidney on August 2. Fistulous tract in kidney was enlarged and finger passed through it into the pelvis. No stone could be felt. Kidney bound down by adhesions. What was thought to be a dilated pelvis or upper portion of ureter was found. Upon making a small opening into this, it proved to be duodenum, and was immediately closed. The ureter and pelvis were then identified and a small opening made into the beginning ureter, through which a metal bougie was passed into the bladder. Ureter very much contracted. No obstruction or stone found. Wound in kidney tissue was closed by catgut sutures as well as the opening into the ureter. External wound was closed at either end. Drained down to closed kidney wound with cigarette drain.

Considerable shock followed this last operation. Temperature remained normal until evening. At 3 A.M., sixteen hours after operation, he had a chill, with sudden rise of temperature to 105.6° F. Dressings were removed, and urine was found escaping through the wound. Eight hours later temperature was again normal. This seemed very much like an attack of urethral fever,

and was probably an ureteral fever due to catheterizing the ureter. Urine continued to escape through kidney wound, and frequent changes of dressings were made.

October 14. A drainage tube introduced into right wound; cigarette drain removed. Weighed dressings on October 14 showed approximately, right side, thirty-six ounces; left side, fifteen ounces.

Until October 24 the average daily quantity in dressings was as follows, right side, varying from thirty to fifty ounces; left side, varying from five to ten ounces.

Immediately after this the quantity in dressings was so markedly diminished that they were no longer weighed, and he continued to pass a large amount through the bladder.

On leaving hospital, November 10, the wound in right side is almost completely closed, the tube having been removed, and dressings are only slightly moistened. No pus. Small rubber tube allowed to remain in the left side; dressings over this are only slightly moistened.

Within a few days after leaving the hospital the wound on the right side closed completely. In spite of the three operations, the cause of obstruction still remains unknown. I believe that we can, however, state very positively that the case is one of obstructive and not reflex anuria, because of the fact that at the second operation a large quantity of urine was found pent up in the right kidney. As to the exact cause of obstruction, I can simply state that to my mind it was most probably a small stone, which either escaped through the wound or was passed per urethram. A careful examination of the bladder failed to discover any stone. A stone no larger than a grain of wheat could have obstructed the very small ureter. It is, of course, possible that the obstruction may have been due to uric acid crystals, masses of cystin, or blood-clots. The cause of the hydronephrosis on left side is also not clear. Several very fair X-ray views, with good differentiations, revealed no stone on either side. The patient later returned to the hospital and had the left hydronephrotic sac removed, and is now in excellent health.

The facts in regard to amounts of urine passed from the bladder and through the lumbar incisions can be approximately stated in the following way:

The operation of August 1 was done after a six-day period of complete anuria. The fluid escaping from the hydronephrotic sac from the morning of the 1st of August to the morning of the 2d contained but a trace of urea.

After the operation of August 2 until October 11, the approximate quantity in weighed dressing was from twenty to forty ounces, each twenty-four hours.

No urine passed by bladder until August 11, and then 45 cubic centimetres, containing much pus, and alkaline in reaction.

From August 11 to September 10, quantity passed from bladder varied from 26 cubic centimetres to 150 cubic centimetres daily.

From September 10 to October 11, the date of third operation, urine from bladder varied from 100 to 500 cubic centimetres daily, and contained considerable pus.

After operation of October 11, urine in dressing varied from thirty-four to sixty ounces until October 24, when this rapidly decreased, and practically ceased November 8. The day following the operation of October 11, 30 cubic centimetres were passed from the bladder; about same quantity until October 18, when 150 cubic centimetres passed. October 19, 1500 cubic centimetres by bladder. October 20, 2000 cubic centimetres from bladder, and 1000 cubic centimetres in dressings. November 8, practically no urine through wound, and 1680 cubic centimetres from bladder, and in reaction trace of albumen and very small amount of pus.

This case led me to a study of the subject of anuria, the results of which I submit in the following brief discussion.

Total suppression of urine occurs:

1. From mechanical obstruction of the ureter of the single functioning kidney of an individual, the other kidney either being congenitally absent or destroyed by previous disease.

2. From mechanical obstruction of one ureter in an individual possessing two functioning kidneys, with increased intrarenal pressure on the obstructed side, which by reflex nerve action prevents the unobstructed kidney from functioning; the so-called reflex anuria. Or, possibly, after a nephrectomy the involvement of the nerves in the pedicle may produce a reflex anuria.

3. From trauma of both kidneys, which, for a time or until fatal issue, is followed by complete cessation of function; also from trauma of a single kidney, which apparently by reflex action so affects the uninjured kidney that complete anuria results.

4. From acute nephritis, as sometimes seen in scarlet fever and other forms of septicæmia.

5. From destruction of practically all kidney tissue as the result of such chronic lesions as tuberculosis, cystic degeneration, etc.

6. From certain poisons, as phosphorus, lead and turpentine, ether, chloroform, etc.

7. From the peculiar condition known as urethral fever, commonly the result of the passage of a catheter or sound.

8. In the polymorphous symptom-complex, known as hysteria, anuria may occur.

Anuria is a condition. It is not a disease *per se*. Until within the last twenty years, indeed, one might almost say until the last ten years, the condition has been discussed merely as a symptom occurring in a number of diseases, which usually marked a fatal termination, and for which little could be done by the medical attendant. Within the last twenty years, however, so much light has been thrown on the subject by Tuffier, Morris, Israel, and others, and so much good has been accomplished by intelligent surgical interference, that to-day the condition of anuria is entitled to be placed, I believe, in the same class as the condition ileus, as one of sufficient importance to be considered and handled as a surgical entity.

Such a consideration of the subject is of special value from a clinical stand-point, because in the majority of cases, or at least in those cases in which interference holds out any prospect of relief, the anuria is the important overshadowing condition with which we have to deal. It is *the* condition which menaces the life of the patient. It is *the* condition which is evident, even though the exact cause of the obstruction may not be clear; and it is *the* condition which must be relieved in order to save the life of the patient.

We are all familiar with the great good that has resulted from the modern method of considering ileus as a surgical entity. The carrying of this method to the bedside, and attempting not a refined diagnosis of the pathological anatomy present, but a diagnosis as to whether we have paralytic ileus, a strangulation ileus, or an obturation ileus to deal with, and choosing our method of treatment accordingly.

It shall be my effort in the present essay to discuss the subject of anuria in somewhat the same way as we do ileus, and attempt to present a working classification which shall be useful at the bedside as a means of determining our line of interference or action.

Henry Morris, in the Hunterian Lectures of 1898, devotes a lecture to the subject of "Calculous Anuria," and gives briefly a historical review of the subject, from which lecture I have obtained the following references to early work on this subject.

Sir William Roberts called special attention to this condition in his work on "Urinary and Renal Diseases," published in 1872.

Pierre Merklen, in 1881, published in Paris an exhaustive treatise on anuria.

Guermonprez reported the first case, operated on in 1870.

Bardenheuer reported the second case, operated on in 1882. Morris operated the third case, in 1884.

Cases then followed, a few each year, until, in 1898, Morris could collect forty-nine cases operated on, and also forty-eight cases reported, but not operated on.

That the subject has not received the attention it deserves is shown, first, by the fact that most modern text-books on surgery either omit it altogether, or dismiss it with a brief and unsatisfactory statement; and, second, by the fact that few practitioners are familiar with the condition, its various causes, and the appropriate means of relief. I confess that my own knowledge of the condition was very limited and vague until the case which I have just reported forced me to a careful study of the subject. To be sure, the condition—anuria—is not one

very commonly met. I understand that the majority of our members have not operated on cases suffering from total suppression of urine. Still, the general recognition of the condition and methods of treatment are, nevertheless, extremely important, because statistics clearly show such a wide difference in results in cases properly and those ignorantly handled. Seventy-five per cent. of early operated cases recover, and but 25 per cent. of the unoperated survive the attack.

The best articles on the subject which I have been able to obtain are those of Henry Morris, in his monograph of 1902, on "Surgical Diseases of the Kidney," and by J. Israel, in his *Chirurgische Klinik der Nierenkrankheiten*, Berlin, 1901. Many of the articles on anuria have been limited to the discussion of calculous anuria, and give one rather a narrow view of the subject. I am inclined to believe that this is a mistake, and that, as an aid to differential diagnosis, the discussion of anuria should be broadened to cover total suppression of urine from all causes.

The clinical classification which I would suggest is the following:

ANURIA.	I. OBSTRUCTIVE.	(a)	Obstruction to ureter of single functioning kidney. This is the most common form.
		(b)	Obstruction of both ureters practically simultaneously. This is very rare from stone; more common from extramural pressure, as carcinoma of uterus.
	2. REFLEX OR PARALYTIC.	(a)	Obstruction of one ureter, increased intrarenal pressure of this side, which, by reflex action, suppresses function on the other side.
		(b)	Removal of one kidney and, by reflex action, from injury to nerves in pedicle; suppression on the other side.
		(c)	In this group can fairly be included the rare cases of hysterical anuria.
		(d)	Traumas of kidney or kidneys.

ANURIA.	{	3. NON-OBSTRUCTIVE OR NEPHRITIC.	{	(a) From nephritis, as after scarlet fever.
				(b) Anæsthetics; ether, chloroform, etc.
				(c) Poisons, as phosphorus, turpentine, etc.
				(d) Poisoning by toxins in various general diseases, as cholera.
				(e) Urethral fever, which, as an acute septicæmia, may produce suppression, or possibly, by reflex nerve action, produce same result.
				(f) Lesions gradually destroying first one and then both kidneys, as tuberculosis, cystic degeneration, etc.

A clear differentiation should be kept in mind between anuria and uræmia. Anuria is a suppression of urine; merely a condition, not a disease. Uræmia is a disease, a toxæmia, developing from a nephritis, or in the course of an attack of anuria.

That uræmia is not due simply to the suppression of urine is clearly shown by a study of the cases of obstructive anuria where patients continue in fair condition for a week, or even two weeks, without a symptom of uræmia developing. Patients with total suppression have lived twenty-five days after the onset of the attack, whereas, as is well known, uræmic patients seldom live more than three days after the beginning of an attack, with total suppression.

Uræmia is usually the cause of death in anuria, but may not develop at all in the cases which recover either spontaneously or are relieved early by surgical interference.

In the first two groups of our classification, *i.e.*, obstructive and reflex anuria, uræmia is not an essential part of the picture. In the third group, non-obstructive or nephritic cases, uræmia is an almost constant accompaniment.

Let us consider these three groups in the order named, and study the pathology, symptoms, course, termination, and treatment.

1. *Obstructive Anuria*.—Here the pathological anatomy reveals at operation or post-mortem, in the great majority of cases, a single functioning kidney, the other kidney congenitally absent, or removed by previous operation, or destroyed by previous disease. The ureter of the single functioning kidney is obstructed by stone, blood-clot, pus, masses of crystal of uric acid, cystin, etc., by kink in ureter, by valve-like action of ureter, with oblique insertion into pelvis, by extramural pressure, as from carcinoma or fibroma of uterus or abscess in pelvis or abdomen.

The simultaneous obstruction of both ureters with resulting anuria is rare.

The symptoms are usually pain of the character of a renal colic, on the side last obstructed, followed by anuria accompanied by tenderness over region of kidney and ureter, and muscular rigidity on that side, sweating, seldom of uriniferous order. In a number of cases, but by no means constant, physical examination determines the presence of an enlarged kidney on the affected side. This is often difficult to determine before anæsthetic because of the muscular rigidity. The general condition of the patient is often surprisingly good; no temperature, no increase of pulse-rate, and, as in my case, the patients often walk about and eat and drink and present to all outward appearance almost a normal condition for a number of days after the onset of the attack. Usually by the seventh or eighth day uræmia symptoms appear, although, as noted, these may be postponed for two weeks or more, and then the patient, if not relieved rapidly, succumbs to the toxæmia. In many cases where the opposite kidney has been destroyed by previous disease, a history of symptoms pointing to this fact can be elicited, or, as in my case, where this previous disease has resulted in a hydronephrosis, this fact may be elicited by the physical examination. Sometimes, however, the onset of the attack is not marked by any acute symptoms, but comes on insidiously, and again may come on very acutely, but without any previous history to aid in the diagnosis.

The most common picture in calculous anuria is quite clear.

A history of repeated renal colic on one side, which results in destruction of that kidney as a functioning organ, and then later renal colic on the other side, with resulting anuria. In other cases, as the McArthur case, reported at our last meeting, the kidney first involved was removed by operation, or, as in the Polk case, a nephrectomy is made on the single kidney possessed by the individual. Polk's case lived eleven days after operation. I have myself performed nephrotomy on a tuberculous pyonephrosis, where the other kidney, as shown post-mortem, had been entirely destroyed by tuberculous disease, and had the patient live twenty-odd days without passing a drop of urine from the bladder. During this period a small amount passed daily, from five to twenty ounces, through the nephrotomy wound.

Senn, in his monograph on "Tuberculosis of the Genito-Urinary Organs," reports a case of intermittent hydronephrosis with anuria during the attack, and gradual enlargement of the left kidney from the retained urine. Senn operated when the patient had had anuria for three days and was becoming uræmic. At the operation, done under infiltration anæsthesia of cocaine, a very greatly dilated and hypertrophied kidney was found and opened with the cautery knife. About two quarts of urine escaped, the kidney tissue was very thick in spite of the dilatation, a stone plugging the ureter was removed, and the patient went on to a recovery. Senn interprets the evidence as pointing to an absence of the other kidney.

The indications for treatment in obstructive anuria are clear, distinct, and imperative, *i.e.*, a nephrotomy on the kidney last attacked, not later than forty-eight hours after the onset of the symptoms. The pain, tenderness, and muscular rigidity usually point clearly to the side to be operated on.

Such nephrotomy meets the vital indications. It furnishes an outlet for the urine; it enables us to remove the cause of obstruction, if in the kidney or pelvis, and by division of the kidney tissue and bleeding relieves the congestion, which, although a result of the obstruction, is a condition which, if it continues, of itself prevents the secretion of urine. Such a

nephrotomy can be rapidly done, probably safest under nitrous-oxide anæsthesia. Prolonged operations, such as removal of stone from ureter, or plastic work on the ureter, should not for a moment be considered at the first operation, but should be postponed until the patient has been relieved of the anuria and brought into fairly normal condition, when it can be more intelligently and safely performed.

Israel quotes statistics giving 66 per cent. of recoveries after operation, and but 28.5 per cent. without.

Morris gives 51 per cent. of recoveries from operation and 20.8 without.

It is to be remembered, however, that many of these operated cases were allowed to go unrelieved for a week or more; and it is quite certain that, if the cases were operated on by the end of forty-eight hours, the recoveries would exceed 75 per cent.

A nephrotomy is to be regarded as the operation of choice, instead of an ureterotomy or incision into the pelvis, because it is easier of performance, can be more rapidly done, gives a freer access to kidney and pelvis, and relieves the congestion.

If, at the time of the nephrotomy, the surgeon finds that he has operated on the wrong side, as has occasionally happened, he should at once operate on the other side, unless, as in my case, there is fair ground for believing that we have a reflex anuria to deal with, and that relieving the pressure in an old non-functionating kidney may relieve the reflex anuria. If, by the next day, however, this hope has not been realized, a nephrotomy should be made on the opposite side.

2. *Reflex Anuria.* — The existence of reflex anuria has been denied by a number of observers. Personally, I have been very sceptical on this point, and doubted the existence of this condition. I am quite positive that many of the reported cases of reflex anuria have been pure types of obstructed anuria, and the cause of the obstruction not found at the operation, or even post-mortem. On the other hand, a careful review of the reported cases, and especially the experimental work of Dr. Arthur Götzl, one of Israel's students, has convinced me of

the existence of such a condition. Götzl showed by experiments on dogs that, by increasing the intrarenal pressure in one kidney, he could lessen and even completely suspend the secretion from the other.

These experiments mimic the conditions sometimes clinically found, and it is quite possible that, as I thought in my own case, we may have a reflex anuria to deal with, *i.e.*, that the great intrarenal pressure in a hydronephrotic kidney on one side might, by reflex action, prevent secretion on the other, and that after relieving the pressure in the hydronephrotic kidney the function of the other side might return.

In my case it is now quite evident that this was not so, as we found from eight to ten ounces of urine on the functioning side. I now accept the possibility of the condition, reflex anuria, and believe that such possibility should always be considered in the handling of a case. I am convinced, however, that it is of rare occurrence.

This question is of great importance in determining the treatment of a case, *i.e.*, in deciding upon which side we shall make our nephrotomy.

Theoretically, in operating on a case of reflex anuria, we should leave the sound kidney alone, and operate on the side which is diseased, and which by reflex action has inhibited the secretion of the other, the sound, organ; and in some cases this plan has been successful in relieving the anuria, as shown by a number of cases where a hydronephrotic kidney causing reflex anuria has been incised or tapped, relieving intrarenal pressure, and this followed by resumption of function by the other kidney.

Practically, the question presents a difficult problem, because the diagnosis of reflex anuria is never to be made at the time of operation with any degree of certainty. In those cases where the pain, tenderness, and muscular rigidity are confined to one side, and on operating on this side a non-functioning kidney is found, and intrarenal tension relieved, we may hope that we have a reflex anuria to deal with, and that this procedure may restore the function on the opposite side.

However, if within twenty-four hours our hopes are not realized, a nephrotomy should be made on the other kidney.

In the anuria from trauma we have a composite and complicated picture. Here both kidneys may be injured and cessation of function result, either from nerve injury or injury to blood-vessels, or rupture of both kidneys and extravasation of urine into the perirenal spaces or into peritoneum. Or we may have but one kidney injured and anuria result from reflex suppression of the other side.

The line of action to pursue must be controlled by the major symptoms present.

A case where anuria is but one of the results of surgical shock, without gross injury to the kidneys, is to be handled by salt solution, per rectum or subcutaneously. A case where anuria is the direct result of gross injury to kidney or kidneys should be operated on, kidney drained, and hæmorrhage controlled. Probably this had best be done under nitrous-oxide anæsthesia.

The reflex anuria following operations on the kidneys, as nephrectomy, is again a complicated picture, where surgical shock, hæmorrhage, the toxic effect of the anæsthetic, and reflex action on the other kidney from irritation of nerves of the operated kidney are so blended that it is difficult to assign to each its proper place. Tilden Brown, in the report of such a case, in Vol. xxxiii of *ANNALS OF SURGERY*, assigns an important place to the anæsthetic and possible pressure on the sound side during the prolonged anæsthesia; also that the very weak heart's action and consequent low intra-arterial pressure was largely accountable for the failure of secretion. He advocates nitrous oxide and ether or nitrous oxide and oxygen as anæsthetic of choice in similar cases to prevent anuria. Personally, I should agree with him, but in all short anæsthesia (for the relief of anuria itself), ten minutes or under, I would strongly advocate nitrous oxide and air. I have never had the opportunity of using it in a nephrotomy for anuria, but have used it in other somewhat similar cases, as in enterostomy for ileus and appendiceal abscess, etc., and am quite satisfied that

the imperative nephrotomy for anuria could be easily done in the ten-minute anæsthesia of nitrous oxide and air, with greater safety to the patient than by any other method. In the absence of nitrous oxide, one might use infiltration anæsthesia of cocaine, as in Senn's case. I have once performed a nephrolithotomy by this method, and removed four stones from the kidney substance and pelvis. The aim should be to prevent post-operative and postanæsthetic anuria by proper choice of anæsthetic, rapid operating, and limiting surgical shock. Little can be done to correct the condition after it is established, except the usual means of combating shock, especially the use of normal salt injections. It is possible that pure reflex anuria results sometimes from the passage of a sound; usually, however, such anuria is septic, and due to an acute septicæmia. We shall consider this, therefore, as belonging under the head of non-obstructive or nephritic anuria.

Hysterical anuria may, I think, be placed in this group of reflex or paralytic anuria. This condition is not infrequently reported, but these cases are undoubtedly, as a rule, cases of deception. Such proved to be the fact in a case observed by Dr. Frank Andrews and Dr. Billings. There are, without much doubt, cases of true hysterical anuria. They are certainly, however, extremely rare, and are usually so closely associated with other evidences of hysteria as to make the diagnosis not difficult. Such a diagnosis would, of course, eliminate any surgical interference from consideration.

3. *Non-Obstructive or Nephritic Anuria*.—Non-obstructive or nephritic anuria has been generally regarded as strictly a medical condition, one which occurred in the course of profound and fatal uræmias, and for which surgery held out no hope.

Within the last few years, however, since operative treatment has been suggested and tried in both acute and chronic nephritis (*i.e.*, splitting the fibrous capsule and stripping the fibrous capsule from the kidney) and nephrotomy, a number of cases of nephritic or non-obstructive anuria had been submitted to operation.

The reasoning on which such treatment is based is the following: The congestion of the kidney present in these cases, although a result and not the cause of the cessation of function, is, nevertheless, a factor in preventing secretion; and if by a surgical operation, as nephrotomy, this congestion could be relieved, secretion might be resumed, and the patient go on to recovery. The position seems logical, and a number of clinical results seem to support it. Such treatment is, however, to be regarded as, as yet, distinctly experimental, and not to be indiscriminately advocated and employed.

Israel, with his wide experience with kidney surgery, does not hesitate to advocate nephrotomy early on one side in case of anuria from scarlet-fever nephritis.

I am quite willing to accept Israel's position with, of course, some reservations.

1. Non-obstructive anuria should, in most cases, be handled medically, best by sweats and normal salt solution injections.

2. When the non-obstructive anuria is simply an incident in a profound toxæmia, no surgical procedure seems warranted.

3. When a non-obstructive anuria is the major factor in a case which has not responded favorably to medical treatment, nephrotomy should be tried under nitrous oxide anæsthesia, and this should not be delayed too long, because the continued intense congestion may permanently disable the kidney epithelium.

The conclusions from this short study are:

1. The clinical importance of recognizing the three forms of anuria—obstructive, reflex, and non-obstructive—is to be emphasized.

2. The imperative necessity of surgical interference in the obstructive and reflex forms, and its possible value in the non-obstructive cases.

3. That in the first two varieties, at least, a rapid nephrotomy on the side of pain, tenderness, and muscular rigidity is the operation of choice. If necessary, do not hesitate to make a double nephrotomy.

4. That nitrous-oxide anæsthesia is probably to be preferred.
5. That time-consuming operations to relieve permanently the obstruction are to be postponed to a later period, after the patient has recovered from the anuria.
6. Operate early by the beginning of the third day.

RESULTS OF DECAPSULATION OF THE KIDNEY.¹

A STUDY OF CHANGES NOTED IN THE RENAL AND PERIRENAL TISSUES OF DOGS
AFTER DECAPSULATION.

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THE following research was undertaken by the writer at the request of Dr. W. T. Howard, of Western Reserve University. Its purpose was to study the changes in the renal and perirenal tissues of the dog following decapsulation of the kidney. The work was done in the Anatomical and Physiological Laboratories of the University of California. Fifteen dogs, varying in weight from twelve to thirty-five kilogrammes, mostly of the mongrel type, and having kidneys varying in weight from 30 to 100 grammes, were used. Changes were studied after two, four, and eight days; two, three, and four weeks; two, and three and a half months.

The kidney of the dog is covered over three-fourths of its surface by peritoneum, the mesentery of its intestine being free throughout its entire extent, while the intestine itself shows no sharp division between the large and the small, such as exists in man. Consequently, the peritoneal cavity must be opened in any operation involving decapsulation. The peritoneum is very closely adherent to the anterior and the exterior surfaces of the kidney, and is separated from it with difficulty. There is quite an extensive circulatory anastomosis between it and the kidney by means of several small vessels which, penetrating the capsule, enter or leave the cortex. In those cases in which the kidney was injected with Prussian blue, the fluid could be seen issuing rapidly through these vessels, bringing

¹ Read before the California Academy of Medicine.

out beautifully the capillary net-work in the peritoneum covering the renal tissue.

OPERATIVE TECHNIQUE.

Preliminary injection of morphine is followed by ether anæsthesia. The dog is placed on its side. An area extending from the last rib to the crest of the ileum (approximately fifteen centimetres wide) and having the edge of the erector spinæ muscles as a guide to its central portion, is shaved, then scrubbed with soap and water, followed by alcohol and bichloride 1 to 1000. The incision is made along the external edge of the erector spinæ group. The fascia is split in the direction of the fibres and separated anteriorly from the muscle by blunt dissection until a point behind the kidney is reached, when the fascia is again opened, the peritoneum ruptured along the external renal border, and the kidney itself drawn through the wound and completely exposed. The capsule is then split from pole to pole, reflected as far as the pelvis, and cut away with scissors. The kidney is returned to place and the wound then closed by layers with interrupted chromicized catgut sutures. The skin is brought together by a continuous over-and-over catgut suture. A dressing of sterile gauze is applied and the whole protected by a plaster-of-Paris jacket. After-treatment was water and bread for twenty-four hours, and after that full diet was given.

Fifteen dogs were operated upon, of which five died. The following is a list of the fatal cases:

Dog 3. White bull terrier, eighteen kilos. Decapsulation of both kidneys and ligation of left renal artery. Death thirty-six hours.

Dog 5. White terrier bitch, ten kilos. Decapsulation of both kidneys. Death from shock three hours.

Dog 7. Mastiff pup, thirty-five kilos. Decapsulation of right kidney. Death three days, hernia through wound (plaster having been removed on account of irritation).

Dog 8. Brown mongrel bitch, eighteen kilos. Decapsulation of right kidney. Scoring of left kidney. Death three days, hernia through wound (plaster also having been removed for the same reason).

Dog 12. Brown spaniel bitch, seventeen kilos. Decapsulation of left kidney. Capsule very adherent and removed with difficulty, fragments of the cortex adhering to it. Death same day.

A study of the urine was not made, as abundant opportunity has been offered to examine this in man after Edebohls' operation for movable kidney, when it frequently shows the presence of blood and hyaline casts.

The dogs that recovered did well after operation, showing little sign of shock. Deaths were due in two cases, 7 and 8, to hernia through the wound, caused by premature removal of the plaster. On dog 3, in addition to decapsulation of both kidneys, the left renal artery was ligated. Dog 12 probably died from leakage of urine from the lacerated kidney into the peritoneal cavity. Dog 5 was the only one on which simple decapsulation was performed that died directly from the shock of operation. The deaths from hernia were due to careless application of the plaster bandages and could easily have been avoided.

The following is a brief *résumé* of the successful experiments:

Dog 14. Newfoundland bitch, thirty-five kilos. Decapsulation of right kidney. Killed in two days.

The decapsulated kidney was found adherent posteriorly, and at its upper pole to the liver; adhesions not extraordinarily vascular.

The free surface was dark red and covered with a very thin, smooth, adherent exudate.

Microscopical Examination.—For purposes of comparison, I will describe the appearance of the capsule of the normal kidney, which applies to all of the normal kidneys examined.

Hæmatoxylon and Congo red. Capsule consists of two layers, the inner, narrow (twenty-seven micromillimetres), its fibres running in straight lines and comparatively rich in nuclei, which are oval, shorter and thicker than those in the outer layer, which is eighty-two micromillimetres in thickness, wavy, and having a few elongated, narrow nuclei.

Mallory's connective-tissue stain gives additional information.

The capsule is colored a brilliant blue, and a distinction between its two layers is brought out very clearly. The outer is seen to consist of from eight to ten thicknesses of long wavy strands of connective tissue, while the inner takes a lighter stain, showing numerous irregular, ill-defined tendrils having a general longitudinal direction, and directly continuous with the intertubular framework. The outer layer is about three times as thick as the inner.

Microscopical examination of decapsulated kidney. Hæmatoxylon and Congo red. Serofibrinous exudate on surface varying in thickness from

45 to 275 micromillimetres, containing numerous red blood-corpuscles with a few lymphocytes and polymorphonuclear neutrophiles.

The inner layer of the capsule persists, but the line of demarcation, between the exudate and it, is not clear. Mallory's stain shows clearly the inner layer of the capsule intact with the exudate resting upon it.

Microscopical examination of cortex. Running inward from the periphery are pyramidal areas (bases outward) of an infiltration consisting of small round cells together with proliferation of new connective-tissue cells. The lines of the infiltration are for the most part along the medullary rays. In places the structure of the tubules is obliterated, while in others they are much distorted. The glomeruli are not involved in the process.

Dog 13. Mongrel poodle, ten kilos. Decapsulation right kidney. Killed on fourth day. The exudate can be picked up on the thumb-nail. It comes away from the kidney readily, but is very friable and tears off in small bits. The adhesions, as have been noted in all the specimens, are principally posterior, and bind the kidney firmly in place to the posterior wall.

Microscopical examination reveals a serofibrinous exudate from 55 to 220 micromillimetres in thickness, containing principally red blood-corpuscles with a few lymphocytes and polymorphonuclear neutrophiles. Mallory's stain shows an increase in the connective tissue of the inner layer of the capsule. Infiltration of the cortical substance of the kidney as noted in Case 14 is lacking.

Dog 15. White terrier dog, fifteen kilos. Decapsulation right kidney. Killed on eighth day.

For the first time a membrane having the characteristics of a capsule is noted. It is well marked, strips readily, and is of a fairly firm consistency. Its color is reddish brown. It varies in thickness, and still more closely resembles an exudate than a capsule.

Microscopical examination. Inner layer of capsule varies in thickness from seventeen to twenty-seven micromillimetres, on which is superimposed an exudate of from five to ten micromillimetres in thickness.

Hæmatoxylin and Congo red show thin continuous layer of newly formed connective-tissue fibres running in straight lines, richer in nuclei than the capsule of the normal kidney, and containing here and there small collections of unabsorbed red blood-corpuscles; no infiltration of kidney substance with cells; no increase in the interstitial tissue.

Mallory's stain shows thin blue line of newly formed capsule. No change is noted in the cortex of the kidney.

Dog 10. Brown mongrel bitch, fifteen kilos. Decapsulation of right kidney. Killed on thirteenth day.

The new capsule is thicker than that of the normal kidney, varying from 137 to 220 micromillimetres. It is not so firm, tears more easily, and is more closely adherent to the surface of the kidney.

Microscopical examination. Thick homogeneous layer of connective tissue, the fibres of which are widely separated. As noted in Case 14 (two days' duration), there is some infiltration in the intertubular tissue of the cortex, with small round cells accompanied by a proliferation of new

connective-tissue cells. The process is not nearly so extensive as in the former case. The glomeruli are not affected.

Dog 12. Black mongrel bitch, fourteen kilos. Decapsulation left kidney. Dog killed on twenty-first day.

The new capsule resembles normal capsule. It is of about the same thickness, but not so firm. Both kidneys have the same color, but the decapsulated one lacks the glazed surface of the other, which is covered with peritoneum.

Microscopical examination. Thin organized fibrous investment of kidney twenty-two to fifty-five micromillimetres in thickness. No change is noted in the cortex of the kidney. One specimen shows the capsule formed and persisting under fatty adhesions.

Dog 1. White and black terrier bitch, twelve kilos. Decapsulation both kidneys. Killed on the twenty-ninth day. Both kidneys injected with Prussian blue through the aorta.

Microscopical examination of kidney, adhesions, and liver. Kidney injected with Prussian blue. Adhesions to liver not vascular; capsule thick and well marked, but with fibres not so compactly placed as those in the normal capsule; light adhesions connected with the liver. The glomeruli and blood-vessels are all extensively injected with the blue. Scattered freely throughout the cortex of the kidney, and having no definite relation to either the pyramidal or labyrinthian tubules, are collections of small round cells, together with a few polymorphonuclear neutrophiles. A similar area is observed in the liver not far removed from its adhesion to the kidney. One patch in the kidney shows a preponderance of polymorphonuclears over small round cells.

Kidney and fat adhesion. The capsule here is not so well defined from the adhesions as in the previous specimen, otherwise they are similar.

The interesting point in these specimens is the fact that the capsule can be seen clearly defined from the adhesions binding it to the liver and other structures. The very slight injection of the adhesions with Prussian blue demonstrates the absence of any important circulatory anastomosis between the kidney and other tissues.

Dog 2. White and black mongrel dog, thirteen kilos. Decapsulation both kidneys. Dog killed on the fifty-second day, and both kidneys injected with Prussian blue through the aorta.

Capsule well formed, strips readily, not so tough as normal capsule.

Microscopical examination. Capsule 82 to 100 micromillimetres in thickness. Mallory's stain shows thick, well-developed capsule, though in a single layer, as has been noted in all new capsules.

Dog 4. White and black terrier bitch, nine kilos. Decapsulation left kidney, with ligation of right renal artery.

The object of this experiment was to see if an added amount of work thrown on the left kidney would add to the vascularity of its adhesions. This did not occur. The dog was killed on the one hundred and fifth day. The right kidney was shrunken to the size of a large chestnut, and was completely disorganized.

Left kidney. Capsule closely adherent and very firm.

Microscopical examination. Thick, irregular capsule 110 to 275 micromillimetres, and having a structure similar to that of Case 2. No changes noted in the cortex of the kidney.

Dog 6. Greyhound bitch, twenty kilos. Nephrectomy right side.

After thirty-seven days the dog was etherized and its abdomen opened. The remaining kidney was found much enlarged, with corresponding increase in size of renal artery and vein. No increase was noted in the amount of circulation taking place between the peritoneum and kidney. The kidney was then decapsulated. No increase in amount of bleeding over decapsulation of kidneys that have not had extra demands laid upon their functions. The kidney was then injected with Prussian blue and the dog killed.

Microscopical examination shows that the thin inner layer of the capsule has not been removed in the process of decapsulation.

Dog 9. Brown mongrel dog, eighteen kilos.

The purpose of this experiment was to study the normal circulatory relations between the kidney and the peritoneum.

Abdominal section. Kidneys injected with Prussian blue through aorta. At various points the blue fluid could be seen issuing from the cortex of the kidney in such amount as to inject thoroughly the peritoneum over it. Peritoneum was found to be adherent to the capsule. When both were removed from the kidney, eight to ten small vessels under the high pressure emitted the injection fluid rapidly.

SUMMARY OF FINDINGS.

First. The capsule of the normal kidney consists of two distinct layers, the outer being much the thicker, while the inner is very thin, the direct continuation of the intertubular connective tissue.

Second. In the operation of decapsulation the outer layer only is removed, leaving the inner lacerated but adherent to the kidney's surface.

Third. At first a thin exudate appears on the free surface of the kidney, which, with the remains of the inner layer, gradually becomes a fibrous investment, resembling macroscopically the normal capsule in that it strips readily, and with the passage of time it becomes more and more firm.

Fourth. Microscopical examination reveals the fact that it is in some cases thicker and in others thinner than the original, the former generally being true, and that in most instances it varies greatly in thickness in the same specimen. Vide Case 4, where it runs all the way from 110 to 275 micromillimetres.

Albarran and Bernard, in experimenting on rabbits, observed the formation of the new capsule up to six months, and found it always thicker than the original after two months. (*Société de Biologie*, 21 Juin, 1902.)

Fifth. The structure, at least up to three and a half months, does not become differentiated into layers, but is one homogeneous mass of fibrous tissue.

Sixth. Case 1 reveals the fact that it will form under adhesions, and is to be recognized as distinct from them both microscopically and macroscopically.

Seventh. There is sometimes an infiltration with round cells and a proliferation of the intertubular connective tissue of the cortex, without, however, affecting the glomeruli. The dogs in whom these changes were noted remained perfectly well as far as could be shown by their appetite, strength, and playfulness.

Eighth, and most important, is the fact that in no case was there any considerable anastomosis between the renal and perirenal blood channels. In Case 4, at the same time decapsulation of one kidney was performed, the renal artery of the other was ligated. This would presumably call for increased activity in the circulation of the decapsulated kidney. It was all, however, made up by the increased size of the renal artery and vein, and not through a peripheral anastomosis.

CONCLUSIONS.

There are many difficulties in the way of drawing inferences as to the value of this measure as a curative or a palliative one in chronic glomerulonephritis. The chief one is that it has up to the present time been found impossible to give a dog an interstitial glomerulonephritis. I quote from Herter, *Philadelphia Medical Journal*, 1898: "I have made repeated efforts with different metallic poisons to experimentally induce glomerular and interstitial lesions in rabbits and dogs, but have regularly failed." He was able to produce merely the lesions of acute degenerative nephritis and congestion. Morse found that toxins of the staphylococcus pyogenes aureus were capable of

initiating those proliferative changes in the interstitial tissues which constitute so prominent a lesion of chronic diffuse nephritis.

Cracow, Maximoff, Davidsohn, and others have shown that it is possible to produce amyloid changes in the kidney by repeated injections of the filtrate from cultures of the golden coccus, readily in the hen, less readily in the rabbit. The amyloid material so formed corresponds closely to that found in man. Herter also used young pigs ten weeks old, two to four ounces of alcohol being given daily. The kidneys after this treatment became large and pale with distended tubules, while the epithelium was granular and fatty; no interstitial changes. It being considered impracticable to produce lesions in the dog's kidney comparable to those in man over a sufficient length of time or with any degree of certainty, it was decided to study only the changes following decapsulation of the normal kidney, and in two cases the effect on the perirenal circulation, first, of the ligation of the renal artery of one kidney with decapsulation of the other, and secondly, of simple unilateral nephrectomy. In neither case was the perirenal circulation appreciably increased.

Edebohls draws these conclusions from his operations on patients suffering from chronic Bright's disease in which the method of decapsulation has been employed.

First. That chronic Bright's disease can be cured by decapsulation of the kidneys in a large percentage of cases.

Second. That the cause of the cure lies probably in the establishment of a collateral circulation between the blood-vessels in the adhesions and those of the kidney. Schmitt, in a very able review of the clinical evidence (*New York Medical Record*, September 13, 1902), raises the following points in objection to Edebohls' first conclusion:

1. Included in Edebohls' cases are some operated upon for movable kidney in which chronic nephritis was diagnosed, and that as a movable kidney by tension on the vessels may become congested, the presence of casts and other alterations of the urine found in chronic Bright's disease is not unusual.

2. That in most of the other cases a sufficient length of time had not elapsed to make the claim of the cure of the disease a justifiable one.

3. That in a large proportion of his cases, Edebohls claims that one kidney alone was affected; whereas Kummel and Strauss have found that it is bilateral in every case of Bright's disease examined by them, basing their conclusions on ureteral catheterization.

4. That in Edebohls' case, and two reported by Furguson where a small portion of the cortex was removed for examination, the section of tissue taken was not sufficiently comprehensive to allow of a positive diagnosis.

As to the theory of Edebohls, that the benefits sometime derived from this operation are due to the establishment of a collateral circulation, I will advance the opinion of Israel and Pousson, who believe that it is due to relief of tension from splitting the capsule of the kidney. Israel disclaims all intention of surgically treating Bright's disease, only employing operative measures when it gives rise to otherwise intractable symptoms of hæmaturia and colic, which furthermore must be traceable to one side only. Dr. A. Pousson, from twenty-three cases by different surgeons, concludes that nephrotomy or nephrectomy may be indicated (*a*) in chronic nephritis complicated with hæmaturia, (*b*) with nephralgia, (*c*) in subacute infectious nephritis, under this head classing the cases of R. Harrison, (*d*) in acute infectious nephritis; miliary abscesses of a kidney and movable kidneys with pyelonephritis are included in this division. Pousson believes that there is a sympathetic relation between the kidneys as between the eyes, and that an operation upon one will frequently relieve the condition existing in the other. He uses protracted drainage in all his cases.

Harrison employs renipuncture or division of the capsule, and gives the following indications for their use.*

* These indications, given by Schmitt in his article summarizing Harrison's opinion as to when operation is advisable, are so well condensed that I have here quoted them verbatim.

1. Suppression of urine with alarming symptoms in scarlatinal nephritis.
2. Progressive signs of kidney degeneration as shown by the persistence or increase of albumen.
3. Where a marked disturbance of the heart and circulatory apparatus arises in the course of inflammatory renal disorders.

The second conclusion of Edebohls, namely, that the improvement is due to the formation of new blood-vessels which anastomose with those of the kidney, has so far not been confirmed by evidence from the autopsy table. Furthermore, it has been shown that added demands on the circulation of one kidney caused by the removal of the other, either with or without decapsulation of the first, does not in the dog produce an increased vascularity of the perirenal tissues.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 14, 1903.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

CHOLECYSTECTOMY.

DR. ALEXANDER B. JOHNSON presented a woman, forty-eight years old, who was admitted to Roosevelt Hospital last August. She stated that for upward of fifteen years she had suffered from attacks of illness which were referable to the biliary passages. These attacks were characterized by vomiting, pain in the region of the liver and radiating into the right shoulder, and many of them were accompanied by jaundice. The attacks gradually increased in severity.

When the patient was admitted to the hospital, she was suffering from an acute attack which had then lasted about five days. She complained of severe pain over the region of the gall-bladder, radiating towards the right shoulder, and she vomited almost continuously. She was not jaundiced. The abdomen was tympanitic, and there was some rigidity of the upper right rectus muscle. The liver could not be felt to be enlarged, but the region of the gall-bladder was extremely tender. There was slight elevation of temperature, and an examination of the blood showed a moderate leucocytosis. There was no bile in the urine.

With the exception of a slight degree of anæmia, the patient's general condition at the time of her admission was very good, and an operation was done the following day. A straight vertical cut was made opposite the border of the right rectus. Upon opening the peritoneum, the gall-bladder was found to be much enlarged; it was tied down by adhesions, and upon separating these it was found to be at least half buried in the liver tissue. It was evidently much distended, and numerous stones could be

felt in its interior. An aspirating needle was introduced, and the fluid withdrawn consisted of slightly bile-stained bloody pus. The removal of the gall-bladder was accompanied by considerable hæmorrhage, on account of the necessity of cutting into the liver tissue. The bleeding was controlled by temporary packing. After the adhesions of the gall-bladder to the liver had been separated and the hæmorrhage controlled, the rest of the operation was quite easy. The cystic duct was cut off as low down as possible, and at that point it was found to be patent. The stump of the duct was inverted and closed by means of a purse-string suture in a similar manner as was usually followed in dealing with the stump of the appendix. With the exception of a small drainage tube placed in the site of the cystic duct, the wound was closed entirely.

The patient did not require any stimulation at all during or after the operation, and, with the exception of a severe and prolonged attack of vomiting, she made a very good convalescence. Since then she has enjoyed excellent health, without any recurrence of her former symptoms.

A pathological examination of the gall-bladder showed that its contents consisted of bile and a cloudy fluid containing blood, pus, and cholesterin. It also contained eighteen light-colored calculi, the largest of which weighed fifteen and one-half grammes. It was found that the mucus coat of the gall-bladder had been entirely destroyed by the inflammatory process, and the fibrous coat was somewhat atrophied.

DR. HOWARD LILIENTHAL said he had done thirty primary operations upon the gall-bladder, twenty-three of them since the first of last January. About eight or ten of these were interval cases. The patients were of various ages, the youngest eleven years old. The operations were done for various reasons, usually calculi. Cholecystectomy was resorted to for cholelithiasis, cholecystitis, gangrene, empyema of the gall-bladder, and various other complications. The speaker wished to emphasize the fact that the operation of primary cholecystectomy, in his opinion, was safer, and was followed by a lower mortality than that of cholecystotomy. He had removed gall-bladders which had gangrenous patches scattered over their surface and extending through to the peritoneum. Some were gangrenous to such a degree that they had to be removed piece-meal. Among his thirty cases he had

had one death, and in that instance the patient had suppurative cholangitis and a left subphrenic abscess, the presence of which had not been suspected. Cholecystectomy was particularly preferable to cholecystotomy in those cases in which there was danger of infection, and especially in the gangrenous type of gall-bladder disease. Such a gangrenous gall-bladder, if left behind, must be regarded as just as great a menace to the patient as a gangrenous appendix. It was located in a region of the abdomen where absorption and general infection were very apt to occur. After the removal of a gangrenous gall-bladder, the patient usually experienced a condition of relief rather than one of shock. Without going into the question of technique, Dr. Lilienthal said that often he could remove the gall-bladder without danger through a two-inch incision. The incision of choice was a vertical one through the middle of the rectus. This had never, in his experience, resulted in a hernia nor in weakness of the abdominal wall, perhaps because the points of entrance of the intercostal nerves into the rectus muscle were not injured.

DR. ROBERT H. M. DAWBARN said that another and a self-evident point in favor of cholecystectomy was that after such an operation the patient would never again suffer from gall-stones, whereas a cholecystotomy offered no such guarantee. An extremely important point in connection with the drainage of these cases was that suggested by Dr. Mayo, of Rochester, Minn.; namely, that the gauze strip inserted for drainage should be fastened in place by a single catgut stitch, so that it could not become displaced by the movements of respiration. This should be done in every instance where drainage was considered necessary. Without this point, the drainage-strip *may* remain where placed; but with this point, displacement is impossible.

DR. JOHNSON said he agreed with Drs. Lilienthal and Dawbarn that cholecystectomy was preferable to cholecystotomy, and for the past two years he had resorted to the former operation in every case of gall-stones in the gall-bladder, and where that organ appeared to be at all a part of the disease complex. During the past year he had done cholecystectomy six or seven times without any mortality from the operation. As to the choice of an incision, whether it was made through the rectus or at its outer edge, he did not think the nerves were necessarily injured. Care should be taken in making the cut, and the nerves pushed out of the way.

While a cholecystectomy was a more difficult operation than the mere drainage of the gall-bladder, still, the treatment of the cholecystectomy wound was quite simple and the after-results of the operation were much better. He had not found it necessary to stitch the gauze or other drainage to the seat of the incision in the common duct after operations on that tube, nor had he found it necessary to do this after removal of the gall-bladder. In the only fatal case of gall-stone operation that he had met with, death resulted from a hæmorrhage into the subcutaneous tissues from a very small vessel. For the purpose of drainage he was not in the habit of employing gauze, but a small rubber tube, which was stitched or pinned to the edge of the abdominal wall. He had not found it necessary to keep the wound open very long.

NEPHRECTOMY FOR TUBERCULOSIS OF KIDNEY.

DR. JOHNSON presented a woman, thirty years old, who had enjoyed good health until three years ago. She then began to have pains in the region of both kidneys, particularly the right. Urination was increased in frequency, and the act was accompanied by considerable burning pain. There was polyuria, but no history of hæmaturia. The patient lost considerable weight. She had no pulmonary symptoms, nor had she ever suffered from night-sweats.

Her symptoms gradually increased in severity, and when she entered the hospital last July, she was pale and anæmic. An examination of the chest gave no positive signs. The right kidney was enlarged and tender. The left kidney was not tender, but could be palpated fairly well. She had moderate fever and leucocytosis. The urine contained albumen, pus, and blood, but no tubercle bacilli were discovered. Upon the 31st of July the right ureter was catheterized: its vesical orifice was reddened and swollen, and appeared to be the seat of a tubercular ulceration. The orifice of the opposite ureter was apparently normal. The urine from the right kidney contained considerable blood, some pus and albumen, but no tubercle bacilli were found.

The right kidney was exposed through an incision made parallel with the ribs. Through such an incision, which could be extended a greater or lesser distance forward, according to the necessities of the case, a very good exposure of the kidney was obtained. The pedicle was well exposed, and was divided before

proceeding with the enucleation. The kidney was found to be notably enlarged and very red and congested. Its surface did not show any pronounced lesions. It was removed without much difficulty. The patient made an uneventful recovery, and left the hospital on the seventeenth day. After the operation she passed an abundance of urine, and within a few days the character of the urine became clearer and better, pathologically. Since then her condition had steadily improved and her urinary symptoms had subsided entirely. There was no frequency, and the urine was entirely clear.

A pathological examination of the kidney which had been removed revealed the presence of numerous miliary tubercles, both singly and in groups. Near the centre of the organ was an area of caseation. There was distinct enlargement of the ureter and thickening of its walls.

In reply to a question, Dr. Johnson said that, after dividing the ureter, he cauterized the cut end of the lower segment and then inverted it.

DR. WILLY MEYER said that in one case of tuberculosis of the kidney where he had removed the kidney, he failed to tie the upper end of the ureter. With the cystoscope it had been shown that the respective mouth of the ureter was ulcerated. For a number of weeks after the operation there was a great deal of urinary discharge through the nephrectomy wound. Evidently the urine from the opposite kidney entered the orifice of the ureter of the diseased side, which was permeated in a retrograde direction on account of the ulceration, and then ran upward into and out of the wound. After exposure of the renal ureteral segment, and after cauterization and ligating its cut end, the lumbar sinus promptly closed. This experience showed the wisdom of tying off the ureter after nephrectomy for tuberculosis.

LOOSE CARTILAGE IN KNEE.

DR. JOHN F. ERDMANN presented a woman, twenty-one years old, who gave a history of an attack of infantile paralysis seventeen years ago. For three years after the occurrence of that attack she was unable to walk. At the age of thirteen she received an injury to the right eye, permanently destroying sight on that side.

During the past five years the patient gave a history of fre-

quent attacks of internal derangement of the right knee-joint. There was no history of any injury. Examination of the knee showed a deep sulcus over the internal tuberosity of the tibia on the anterior surface, with an occasional presentation of what appeared to be a cartilage. This readily slipped from under the fingers.

On December 12, 1902, a semilunar incision was made on the inner side of the anterior aspect of the joint. Upon opening the joint, a displaced semilunar cartilage was found, lying well back in the joint. It was perfectly free from all anterior and lateral attachments. This was removed, the joint was closed without drainage, and the patient left the hospital within ten days. Since that time she has had absolutely no manifestations of her former difficulty.

GUNSHOT WOUND OF SKULL; LACERATION OF THE SUPERIOR LONGITUDINAL SINUS.

DR. ERDMANN presented a man, twenty-six years old, a porter by occupation, who was admitted to Gouverneur Hospital on April 28, 1902, with the history of having been accidentally shot, the bullet entering the head in the median line, just above the forehead.

Upon admission, the patient was unconscious, and there was apparent loss of power on the left side. His breathing was slow and regular; temperature, 99.5° F.; pulse, 52, irregular in character. There were two wounds in the scalp; these were three-quarters of an inch apart, irregular in contour, and about the size of a 32-caliber ball. The skull was comminuted, and the bleeding was so profuse that a rupture of the longitudinal sinus was suspected. Upon removing the fragments of bone, a terrific hæmorrhage occurred, which was traced to a large tear in the superior longitudinal sinus. Owing to the severity of the bleeding, the wound was hurriedly packed with sterile gauze and the scalp-flaps drawn together and sutured over the packing. The patient was sent to bed in a poor condition. There was no improvement in his semiconsciousness, and the paralysis remained unchanged.

On April 30 the sutures in the wound were removed, together with the packing, with the idea of doing further work; but another fierce hæmorrhage occurred and the wound was again packed. Two days later the packing was again removed, and

while the bleeding was less severe, nothing could be done but to repack the wound. On May 5 there was no hæmorrhage when the packing was removed, but the patient's condition did not warrant any further interference, although the paralysis of the left side was gradually deepening.

On May 11, as the paralysis was still present and the patient was unable to recognize any one or to speak, it was decided that the motor cortical area of the right side was being compressed, in addition, in all probability, to its primary laceration produced by the bullet in its course. During this period, the patient's pulse never rose above 80, and usually ranged between 52 and 70. The temperature varied from 100.4° to 102.6° F., and usually remained between 100° and 101.6° F.

On May 11 a horseshoe incision was made over the motor area on the right side, and an omega-shaped flap of bone was raised. The incision through the scalp was accompanied by a very profuse hæmorrhage, which was controlled with difficulty. Upon exposing the dura, which presented a dark, bluish color, no cerebral pulsation was evident. The dura was incised, and a three-ounce blood-clot evacuated, with some brain tissue. This blood-clot was removed by the use of a blunt uterine curette. The track of the bullet was evident by the laceration of the brain tissue at this point, and readily admitted a piece of drainage tube half an inch in caliber. The track of the bullet as well as the cavity made by the clot were washed out with saline solution, and the incision in the dura was sutured, with the exception of one small point where a piece of rubber tissue drainage was placed so as to communicate with the track of the bullet.

The effect of the operation was immediate. When the patient recovered from the anæsthetic, he talked rationally and was able to recognize his friends. The following morning he asked for food and drink. Sixteen hours after the operation he was able to move his left thigh and leg, and the paralysis of this extremity disappeared entirely within three days. The first effect of the operation upon the left upper extremity was observed after a week had elapsed, when it was seen that efforts at abduction and adduction of the arm and flexion and extension of the forearm were made. The condition of the upper extremity improved daily, so that by the end of July the patient was able to use his left arm to very good advantage. At least 60 per cent. of its normal

power had been restored. By September all its functions were restored excepting complete supination of the forearm and abduction of the arm. Flexion and extension of the fingers, while present, were not strong. At the present time there was still slight impairment of supination and abduction of the arm and flexion and extension of the fingers.

DR. DAWBARN said that on account of the repeated hæmorrhages which Dr. Erdmann had to contend with, it appeared to have been a favorable case for the carrying out of a suggestion which was made in the *New York Medical Journal*, in 1887, by Professor Webster, and first employed by the speaker, namely, to cord the extremities so as to limit the supply of blood in the head. The speaker said he had employed this procedure, for example, with marked success in a case of Graves's disease where he tied off the four thyroid arteries. The veins were enormously distended everywhere in the neck, and this promised an ugly degree of hæmorrhage while operating. But by accumulating blood in the limbs for five minutes or so before operating, the neck ceased to be congested, and the cutting was done safely, where otherwise this would have been impossible. Dr. Dawbarn added, that this case taught an obvious lesson of value in many head and neck operations.

In regard to the kind of gauze used for packing, Dr. Dawbarn thought it would be advisable in all such cases to employ the non-absorbent variety. A non-absorbent, sterile gauze, made in various widths, is prepared by Johnson & Johnson. This is equally as effectual as the absorbent in promoting clotting by its mere contact, and it may make all the difference between life and death, by saving some ounces of blood in a case on the verge of shock. Absorbent gauze invites bleeding until it has become saturated. Referring to the use of a plate for the purpose of covering the gap left in the skull, in Dr. Erdmann's case, the speaker said he had found an excellent material for such plates in the shape of celluloid which was specially prepared for him by the Arlington Chemical Company of New Jersey. This resembles in general appearance a slightly yellowish window glass. It differs from the ordinary celluloid in that the nitric acid is most carefully eliminated, thus rendering it non-irritating; and a small quantity of synthetically prepared urea is added to make it elastic, instead of employing camphor for this purpose,—which latter in the

necessarily considerable amount is rather an irritant. Immediately after boiling this plate can be bent to a dome-shape, which is advisable where it must replace a large surface of skull. It should rest upon the vitreous table, the outer table being slightly the more chiselled away to permit this. While hot, it whittles like soft pine. Being transparent, it is easy to scratch upon its surface the exact shape desired, as seen through the plate in place; and then with great speed the shaping is accomplished. The writer considers, from his experience, this material ideal for this purpose.

DR. WILLY MEYER said that some years ago he implanted in a case of Jacksonian epilepsy an ordinary large celluloid plate under the scalp, and when he removed it, for special reasons, about a year later, it apparently had undergone no change whatever. He did not think it was always necessary to use a specially prepared kind of celluloid, such as Dr. Dawbarn had described. The patient had been repeatedly presented before the Society.

TUMOR OF THE BRAIN.

DR. OTTO G. T. KILIANI presented a man, thirty-two years old, who came under observation September 19, 1902. His family history was negative, and his previous health had been excellent. His habits were good; there was no history of syphilis or alcoholism.

A year previous he had an attack of partial deafness; this gradually passed off and no attention was paid to it. In June, 1902, while lifting a fender from a trolley-car, he suddenly felt faint and became dizzy; he was very pale and unable to speak. He was assisted to the sidewalk, but recovered after a time and was able to go home alone. He recovered his speech somewhat, but not with the former fluency. This difficulty of speech has steadily been increasing. There was no vomiting at any time. Subsequently, severe headaches developed, usually frontal, but often general. His sight gradually became poorer.

Two weeks before he came under observation he had another attack. There was sudden numbness of the right hand, and the hand became pale. This pallor of the right upper extremity was very pronounced, and the speaker said he looked upon it as a rather unusual vasomotor symptom. Following the numbness of the right hand, the foot on the corresponding side became numb. The patient seemed dazed, and complained of a very intense

headache. The attack lasted about five minutes, and when he recovered from it his right hand, arm, and leg seemed weaker than before, and his speech was still further impaired. On September 17 he had a third attack, which was characterized by numbness beginning in the right hand and extending to the arm; saliva drooled from the right side of the mouth, then the numbness extended to the right leg, and the patient became unconscious for a few minutes. These observations were made by the patient's wife and could not be absolutely relied upon. When he recovered consciousness there was intense headache. There was no vomiting.

An examination of the patient's eyes showed that the pupils reacted to light and accommodation; there was no impairment of muscular power and sight was not diminished. The man's speech was slow and stammering in character. He recognized objects and knew their names, but he found it difficult to speak a sentence. An examination of the heart, lungs, liver, and spleen proved negative. There was apparent impairment of the pain and tactile senses in the region of the right arm and leg, together with muscular weakness. The right side of the face was similarly affected. The knee-jerk on the right side was increased. With the exception of a faint trace of bile, the urine contained nothing abnormal. On September 24, when the patient was seen by Dr. George W. Jacoby, his symptoms were practically unchanged, excepting that the right foot dragged a little and there was distinct right-sided facial paresis. On the following day he had an attack similar to those already described. The symptoms indicated a subcortical brain tumor located on the left side under the arm and speech centres, and growing outward.

On September 26 the patient was admitted to the German Hospital. At that time there was distinct facial paralysis, aphasia, and weakness of the right hand and leg. The ophthalmoscope showed a beginning optic neuritis on both sides.

On September 30, two X-ray pictures were taken of the patient's head, both of which showed a distinct opaque area over and around the lower Rolandic fissure. Dr. Kiliani said he had shown these plates, as well as the prints made therefrom, to Dr. Robert Abbe, who was not inclined to believe that the opaque area indicated the presence of a tumor, and said he had seen similar shadows produced by slight moisture on the X-ray plate.

In order to verify this observation, Dr. Kiliani said he had made a number of experiments in connection with X-ray work upon the human head, moistening the plate in some instances, and in others the patient's hair, but he had never been able to get a shadow at all similar to the one obtained in the case under discussion, just as he never got any shadow from moisture of feet standing on plates. He was unable, therefore, to agree with Dr. Abbe's opinion in this instance, and was sure that the opaque area shown in the two plates constituted a sufficient proof that it is the shadow of the tumor. The only method by which he could explain this radiographic demonstration of a soft brain tumor was to take the skull and its contents as a physical unit; if there was any plus to that unit, he saw no reason why, under favorable conditions, this increased density could not be demonstrated by the X-ray. He was convinced that if a tumor of the brain was under- or over-exposed, it would not show on the plate.

The patient was operated on by Dr. Kiliani, October 7, 1902.

Horseshoe flap of cranium with base above the ear was made by means of Doyen drill and Gigli saw, extreme difficulty being encountered owing to the thickness of skull and densely adherent dura. Exposure of dura revealed a distinct bulging a little below the middle of the parietal lobe. Electrical excitation over entire motor area gave no response. Curved incision in dura, parallel with but within craniotomy line, allowed laying bare of cortex, presenting parietal and part of frontal and occipital convolutions. Direct electrical stimulation over motor area again gave no response. After reflexion of dura above mentioned bulging disappeared; palpitating finger discovering no hard mass. Aspiration also negative. Incision two inches in length was then made in sagittal direction over the suspected place through the cortex. Exploring finger finally found tumor situated one-fourth to three-fourths of an inch underneath surface, densely adherent to surrounding structures and apparently pediculated below, where its vascular supply was obtained. Blunt enucleation of tumor by the finger was followed by considerable bleeding from brain substance. The tumor presented the shape and size of a small hen's egg, being one and seven-eighths inches long and one and five-eighths inches broad.

Small gauze packing into cavity, replacement of dura and cranial flap, a narrow strip of gauze being led through a drill-

hole. The loss of blood was so extensive that a saline infusion became necessary.

Seven hours after the operation the man showed signs of returning consciousness, and at the expiration of fourteen hours he plainly pronounced the first word he had been able to speak for five weeks. On the fifth day, when the packing was removed, a considerable prolapse of the brain occurred, and the opening was closed with some difficulty. There was also some difficulty in the coaptation of the skull-plate, and this resulted in slight necrosis; otherwise, the patient's recovery was uneventful. On the seventh day he began to use the affected arm and leg, and since then the improvement has steadily continued. He still drags the leg slightly in walking, nor has he regained the full use of his arm. His speech is fairly good, but still impaired to some extent. His facial paresis has practically disappeared. His intelligence did not seem to have suffered at all.

The pathologist who examined the tumor pronounced it a gliosarcoma, composed of small round and spindle-cells, which rendered the ultimate outlook of the case not very hopeful.

AMÆBIC COLITIS TREATED BY FLUSHING THROUGH THE APPENDIX.

DR. ROBERT H. M. DAWBARN presented a man, twenty-five years old, who was admitted to the City Hospital September 15, 1902. His family history was unimportant. As a child, he had suffered much from summer complaint. He gave no venereal nor specific history, and for the past five years he had not used alcoholic stimulants in any form. Previous to that time he took an occasional glass of beer. He was a heavy cigarette smoker. He had never had any regular occupation until 1898, when he enlisted in the United States Army and was sent to the Philippine Islands, where he remained for two years and eight months. A year ago, while on duty in the Philippines, he contracted pneumonia, and remained in bed for ten days. During this illness his bowels were loose, averaging four or five formed stools a day. Since that attack he had never been entirely well. Last March he was in a hospital in San Francisco for two weeks with an attack of dysentery. He averaged between fifteen and twenty small, watery stools daily; these contained blood and mucus. When he left the hospital his condition was much improved, having only three or

four movements a day. When he came to New York he had a similar attack, which lasted six weeks. He was treated in the City Hospital from June 30 to September 8, 1902. When he left the hospital he was improved, but he returned a week later, stating that his trouble had recurred three days before. At that time he was having about half a dozen small, watery, blood-streaked stools daily. He did not complain of much tenesmus or abdominal pain, but of headaches and nausea. He was again placed under treatment, but without much improvement. The fæcal dejecta were examined by the pathologist of the hospital, and this established the amœbic nature of the trouble.

As the abdominal tenderness now extended over the entire area of the large intestines, it seemed wise to try irrigation of this whole tract, beginning at the cæcum. In order to accomplish this, the technique which was described by Dr. Robert F. Weir in a paper read before the Surgical Section of the American Medical Association at its last meeting was adopted, *i.e.*, irrigation through the lumen of the appendix. The steps of the procedure were as follows: Through the McBurney muscle-splitting incision the meso-appendix was exposed and separated from that organ. The appendix was then drawn up rather snugly, bringing the cæcum in contact with the belly-wall. The split muscles were closed by chromic catgut sutures as closely as safety to the circulation of the appendix permitted. Differing from the practice of Dr. Weir, in the only case which he had thus far recorded, it was deemed safer to defer opening the tube until twenty-four hours had elapsed; meanwhile, a catgut stitch upon either side through its muscular wall and the skin prevented its slipping back. The following day the organ was cut across. This was done at a point about one centimetre above the skin, and the end was split into four very brief flaps, which were turned back and attached to the skin.

The operation was done December 10, 1902, and through this opening in the appendix irrigation of the large intestines was at once begun. A 1 to 10,000 solution of permanganate of potassium (ten pints) was given, alternating, every six hours, with the same quantity of normal salt solution, at a temperature of 120° F. At first a rather sharp-pointed glass cannula was employed in making the irrigations, but this, through the carelessness of the orderly, pierced the appendiceal wall (fortunately,

near the skin surface) after a few days, and could no longer be introduced. This trauma healed within a few days, during which the appendix was let alone; and subsequently a soft-rubber catheter of small caliber was substituted for the glass cannula and no further trouble occurred.

The result of the treatment thus far, Dr. Dawbarn said, had been highly satisfactory. The soreness along the large gut had practically disappeared, and the amœbic character of the discharge was wholly at an end. When the cure was complete, the speaker said, he intended to dissect down about the appendix, stretch and invert it without opening the peritoneal cavity; just as in his technique in appendicitis work, except that he could not put the surrounding purse-string suture in the cæcal walls. It was a question whether or not the method suggested by Dr. Weir was preferable to that of the Kader technique, in the wall of the cæcum or ascending colon, as suggested by Dr. Gibson. Only further experience would determine that point.

Dr. Dawbarn, in closing, said that the present case was one that chanced to be very favorable for Dr. Weir's method, having an appendix of large caliber and with well-developed, thick walls. In numerous appendices ordinarily met with the plan would probably not prove so simple, because of very small caliber or strictures, etc.

DR. F. KAMMERER emphasized the importance of putting the bowel completely at rest in the treatment of these obstinate cases of colitis. He thought the result would not be as good if the fæces were allowed to travel through the colon. The speaker referred to a case which he showed at a recent meeting of the Society where he had established an artificial anus, with spur formation, for about three months.

DR. WILLY MEYER said he had recently followed Dr. Weir's method in a case of syphilitic ulceration of the large intestine and rectum, with hæmorrhages. In that case he did not strip the appendix, but stitched the tip of the meso-appendix to the lower angle of the wound. After closing the skin, he opened the appendix and was able to introduce a small, English bougie, followed by a No. 12 soft-rubber catheter, through which the colon had since been irrigated. The opening in the appendix was now flush with the skin, the patient was always clean and dry, and Dr. Meyer said he looked upon the operation as a very satisfactory

one. As an appropriate name for this procedure, the speaker suggested appendicostomy.

EXTIRPATION OF THE ENTIRE COLON, THE UPPER
PORTION OF THE SIGMOID FLEXURE, AND FOUR
INCHES OF THE ILEUM FOR HYPER-
PLASTIC COLITIS.

DR. HOWARD LILIENTHAL presented a woman, twenty-three years old, who was admitted to Mt. Sinai Hospital in the autumn of 1899, in the service of Dr. Morris Manges. The history she gave was that for several years she had suffered from diarrhœa, accompanied by hæmorrhages and the passage of foul mucus from the bowels. She finally became so weak and anæmic that another surgeon had done a left inguinal colostomy for the purpose of giving rest to the lower portion of the colon and the rectum. This operation had revealed the fact that the walls of the bowel were covered with polypoid growths which bled easily, even on gentle manipulation. The patient was much benefited by the operation, and the hæmorrhages finally ceased, so that it was thought best to close the artificial opening. As soon as she left the hospital, however, her old trouble returned. She had as many as twelve stools daily. There was much abdominal pain and some vomiting. The diarrhœa and bleeding were aggravated by the ingestion of certain articles of food. An examination of the rectum disclosed the presence of several polypoid masses.

On December 30, 1899, Dr. Lilienthal opened the caput coli through a wound in the right iliac region, in order to give the entire colon as much rest as possible. Throughout its entire length the colon was filled with polypoid masses. There was no normal mucous membrane, the entire mucosa being covered by large and small papilloma-like excrescences. One of these was removed and examined by Dr. Mandlebaum, the pathologist of the hospital, and proved to be a hypertrophied solitary follicle. After this operation, various irrigations and injections were tried, and the patient improved greatly. The hæmorrhages almost ceased, but it was evident that the closure of the right colostomy wound would be followed by a recurrence of her old trouble. The exclusion of the entire colon from the alimentary tract promised the greatest relief with the least degree of risk. Accordingly, March 6, 1900, an end-to-end ileosigmoidostomy was performed.

Following this, the patient's condition rapidly improved, but she insisted on having the right colostomy wound closed because, even after some months, there was a copious discharge. This necessitated the total extirpation of the colon and the stump of the ileum. This operation was done June 15, 1900, and since her recovery from that operation the patient has been perfectly well. Immediately following the last operation, she had numerous liquid stools daily, but the number gradually diminished, and now she usually has two formed stools daily. Since the operation she has had one slight attack of constipation, which yielded to a mild cathartic.

In connection with this patient, Dr. Lilienthal showed the section of the gut removed. He stated that in January, 1901, he presented the patient at a meeting of the Surgical Section of the New York Academy of Medicine, and a full report of the case was published in "American Medicine," Vol. i, page 164.

DR. KAMMERER said the fact had frequently been demonstrated that, in spite of the removal of extensive portions of the large intestine, the bowels eventually became regulated. The speaker said he had under observation at the present time a patient in whom he excluded about seven feet of intestine, including the ascending and most of the transverse colon, and in spite of this the bowels only moved once or twice a day after several months had passed. Dr. Kammerer thought that in the majority of such cases an ileocolostomy, eventually an ileosigmoidostomy, was the preferable operation. He thought that in the non-malignant cases there was no necessity for the application of so radical a measure as the extirpation of the entire colon, more especially as we know that exclusion of the intestine is followed by atrophy of the excluded portion and, in consequence, by a marked diminution in the secretion from the mucous membrane of the latter.

PERFORATED GASTRIC ULCER.

DR. BENJAMIN T. TILTON presented a man, thirty-nine years old, who was admitted to the Lincoln Hospital November 3, 1902. His family history was negative and his habits were good. During the past six or seven years he had several attacks of abdominal pain; these usually lasted about a week and were accompanied by tenderness on pressure and vomiting, the vomitus being very acid. The pain was most severe in the epigastric region, and

usually came on after eating. His last attack began September 15, 1902. The patient was under treatment at this time, but there was no apparent improvement in his symptoms. He lost flesh and became very anæmic, and on the 1st of November he was obliged to give up his work, which was that of a truckman. On that day he was not feeling as well as usual, and about three o'clock in the afternoon he felt a sudden, sharp pain in the epigastric region. He was obliged to lie down, and said he "felt as though some of his organs were being turned around." He was nauseated, but could not vomit. On the following two days he was treated by his family physician; but his symptoms growing worse, he was removed to the hospital just forty-eight hours after the onset of his attack.

Upon admission, his temperature was 101° F.; pulse, 120. An examination of the heart, lungs, and liver was negative. The abdomen was distended and tympanitic, especially in the right hypochondriac region. No mass could be made out. The appearance of the patient indicated that he was a very sick man, and apparently suffering from general peritonitis, probably due to perforation of an ulcer of the stomach.

Two hours after his admission (fifty hours after the onset of his acute symptoms) the patient was placed on the operating table. A median incision was made, extending from about an inch below the ensiform cartilage to below the umbilicus. Through this opening a large amount of gas and turbid fluid escaped. The intestines were distended and congested, and everything pointed to a progressive general peritonitis. There were no adhesions. The viscera, particularly the liver, were covered with lymph. A small perforation was found on the anterior surface of the stomach, close to the pylorus. It was surrounded by an area of indurated tissue, evidently belonging to a gastric ulcer. The edges of the perforation were inverted, and two rows of Lembert sutures were inserted. A portion of the omentum was then sewn over it. The abdominal cavity was flushed with saline solution and carefully sponged out. The peritoneum was brought together with catgut and the abdominal wound closed, with drainage. When the patient was sent to the ward, his pulse was 160 and very feeble, but he finally responded to active stimulation and made a fairly quick recovery. For six days he was sustained by rectal feeding, and then began to take fluid nourishment by the

mouth. His highest temperature after the operation was 101.6° F. on the third day; it reached the normal on the eighth day, and from that time on his convalescence was uninterrupted. The abdominal fistula was slow in healing, but there have never been any signs of leakage from the opening in the stomach. The patient gained twenty pounds in weight since the operation, and since that time he has had no symptoms referable to the stomach.

Dr. Tilton said the above case seemed rather unusual on account of the indefinite history of gastric ulcer preceding the perforation, and also because of the successful outcome of the operation in spite of the fact that fifty hours had elapsed since the perforation before an operation was done. In a recent collection of 103 cases of perforated ulcer of the stomach made by Mikulicz, the mortality of the operation was 39 per cent. in those cases where it was done within twelve hours after perforation; of those operated upon between twelve and twenty-four hours after perforation, the mortality was 76 per cent., and of the later operations, 86 per cent. In his case, Dr. Tilton said, the small size of the perforation was a favorable factor.

GENERAL PERITONITIS, PROBABLY OF GONORRHŒAL ORIGIN.

DR. TILTON presented a woman, twenty-one years old, who was admitted to the Lincoln Hospital November 14, 1902. She had been ill for one week. Her family history was negative. She denied gonorrhœa and syphilis. A year ago she had an attack of rheumatism, her description of which gave rise to the suspicion that it was an arthritis of gonorrhœal origin. There was no history of an abortion nor any interruption of the menstrual periods, but during the past three months her menstruation had been somewhat irregular. She suffered from constipation.

Her present illness dated from November 8, 1902, when she had a sharp pain in the abdomen. Following this, she vomited frequently and had a headache. During the next six days she was unable to retain any food, and felt most comfortable lying down, with her knees and thighs flexed on the abdomen, and the head slightly raised.

At the time of admission to the hospital her temperature was 102° F.; pulse, 120; respirations, 30. She was poorly nourished and anæmic in appearance. The tongue was coated. The heart and lungs were normal. The abdomen was rigid and tender,

especially in the epigastrium and over the region of the appendix. As this organ was the possible source of the trouble, an inter-muscular incision was made in the right iliac fossa. The appendix was found to be normal, and free pus was found in the peritoneal cavity. This incision was thereupon closed and a second one made in the median line. This revealed the presence of a great deal of free pus and fibrin, particularly in the lower part of the peritoneal cavity. Upon exploring the pelvic region, the Fallopian tubes were found to be slightly distended and very hyperæmic, and upon pressure pus was extruded from both at the fimbriated extremity. No other evidences of abscess were found. The intestines and uterus were covered with fibrin. Both tubes and ovaries were removed, and the peritoneal and pelvic cavities were thoroughly irrigated with a large quantity of salt solution.

For forty-eight hours after the operation the patient's condition was extremely critical. Her pulse was very weak and rapid; the bowels refused to move, in spite of the administration of calomel and enema, and from time to time she vomited a quantity of greenish fluid. On the third day the bowels moved freely, and from that time on the patient showed signs of improvement. She remained in the hospital thirty-nine days, and was discharged, cured, on December 23, 1902.

An examination of the pus in the tubes failed to reveal any gonococci, but in spite of this, Dr. Tilton said he was inclined to believe that the peritonitis was of gonorrhœal origin. The infection was undoubtedly of recent date, as there were no adhesions nor occlusion of either tube.

TUBERCULOSIS OF RETROPERITONEAL GLANDS.

DR. WILLY MEYER presented a girl twenty years of age who came under his observation last autumn. She was suffering from lymphatic nodes, evidently tubercular in character, in Scarpa's triangle, and a tumor of considerable size could also be made out in the abdomen, to the right of the umbilicus. The patient complained of continuous and severe pain in the region of these growths, and insisted upon an operation.

On October 4, Dr. Meyer made an incision in the femoral region, and came down upon a chain of enlarged glands which extended upward into the retroperitoneal region. The nodes were of the hard variety. After Poupart's ligament had been divided, the retroperitoneal glands were attacked. They were so

adherent that, in spite of every care, the peritoneum was torn. The empty sac of a right inguinal hernia was loosened from its bed, split in two, and used for covering the tears in the parietal peritoneum, which could not be stitched. Three of the enlarged glands were removed from behind the pubic bone with great difficulty, on account of their adhesions to the surrounding vessels. After careful sterilization of the bed of this chain of glands, the wound was closed with gauze drainage.

The patient made a good recovery from this operation, but still complained of pain in the region of the tumor in the abdomen, which was regarded as a package of enlarged retroperitoneal gland. An abdominal incision was made through the right rectus muscle, and, after splitting the anterior layer of the mesocolon, a number of enlarged glands were found, which were removed. Towards the root of the mesocolon more enlarged glands were found, which were also extirpated. After disinfection with iodoform ether, the mesocolic wounds were closed, without drainage, and the patient has improved very much since the operation. She does not experience any more pain, and is able to attend to her duties. The scars are firm, no tendency to hernia.

PERINEAL PROSTATECTOMY.

DR. WILLY MEYER presented a man, sixty-three years old, who gave all the symptoms of an enlarged prostate, and also some which were suspicious of vesical stone. He had had repeated attacks of hæmaturia, with pain and interrupted stream. Through the rectum, the enlarged prostate was easily made out, and the cystoscope revealed an enlarged median lobe and a medium-sized stone. The patient was suffering from marked emphysema and chronic bronchitis, and on that account a general anæsthetic was deemed inadvisable. It was finally decided to do a perineal prostatectomy under local or spinal cocaine anæsthesia. But the Schleich method proved entirely inefficient. Five centigrammes of tropacocaine were thereupon injected into the spinal canal, and under this form of anæsthesia, the operation, which lasted about forty minutes, did not give rise to the slightest degree of pain. In shelling out the enlarged prostate through the perineal wound, the prostatic urethra was torn in part, as it usually was in this operation. After completing the prostatectomy, the vesical stone was removed through the same opening. The patient made an uneventful recovery, and the perineal tube was removed on the

eighth day. He was up two days later. The man now enjoyed excellent health, and was only obliged to urinate three or four times daily. There is not a drop of residual urine.

THE BOTTINI OPERATION FOR PROSTATIC HYPERTROPHY.

DR. MEYER presented a man, forty-nine years old, who gave symptoms of retention of urine. The case was easily recognized, with the help of the cystoscope, as one of prostatic hypertrophy, although no tumor could be felt per rectum. Dr. Meyer said he had recently seen the statement in an article on this subject that if no tumor could be made out through the rectum, then there was no hypertrophy of the prostate. The speaker said he could not endorse that statement, as, according to Motz, fully 33 per cent. of prostatic tumors could not be palpated per rectum.

In the case under discussion the cystoscope revealed an intravesicular prostatic growth and a trabecular bladder. As the result of infection, the patient had developed a unilateral pyelonephritis. On June 18, 1902, he was operated on by the Bottini method. His urinary symptoms immediately improved, but his recovery was delayed by the occurrence of an epididymitis, and subsequently by a marked inflammation of the corresponding testicle, which finally suppurated and had to be removed.

The patient was now able to hold voluntarily from 250 to 300 cubic centimetres of urine, and passed it without any trouble. The quantity of his residual urine had decreased from 410 cubic centimetres to one or two drachms.

DR. HOWARD LILIENTHAL said he usually preferred the suprapubic method for the relief of prostatic hypertrophy, unless there were some special contraindication. He did not hesitate to allow his patient, if old and feeble, to sit up on the third or fourth day after the operation, and to get out of bed as early as the sixth day.

DR. KAMMERER said he had done nine perineal prostatectomies since last June. Some of these cases were complicated by stone, as in the one reported by Dr. Meyer. In one instance, a man aged sixty years, he removed 156 calculi from the bladder after prostatectomy. The speaker thought that perineal prostatectomy would prove the future operation of choice. By that method there was less danger of injuring the urethra than by the suprapubic operation.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, January 5, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

THE DIAGNOSIS OF INTESTINAL INJURY FOLLOWING ABDOMINAL CONTUSION.

DR. ROBERT G. LE CONTE delivered the Annual Address on Surgery, taking as his topic the above subject, for which see page 525.

DR. JOHN H. GIBBON mentioned the case of a boy who was brought to the Polyclinic Hospital in a state of marked shock, he having fallen and struck his abdomen upon the edge of a basket containing thirty-five or forty pounds of meat. When seen one hour after the receipt of injury, the boy was suffering a great deal of pain and his abdomen was rigid. It was thought that operation would later be required, but within five hours the boy was much better and went on to a speedy and entire recovery. This case illustrated the wisdom of not operating during shock. A second case was that of a boy crushed by a trolley-car and seen at the Pennsylvania Hospital soon after his admission at 6 P.M. At that time he was vomiting, but there was no marked rigidity nor pain. At 11 P.M. a telephone message stated that the only prominent symptom had been vomiting, which still continued, there being as yet no local pain nor rigidity. Considering that the symptoms of most value as indicating operation were pain, rigidity, and facial expression, with perhaps increased thoracic respiration, intervention was not regarded as necessary. The following day the patient developed rigidity with abdominal distention, and still had vomiting, which had persisted from the first. Operation revealed the fact that the lower two feet of the

ileum, with the exception of two inches immediately at the colon, were stripped from its mesentery, and that the middle six inches of this portion were entirely denuded of its peritoneal coat. This part of the bowel was gangrenous, but there was no perforation. The bowel was resected, but the patient afterwards died, no aggravation of symptoms following the operation. The cause of death is believed to have been peritonitis. This case impressed Dr. Gibbon with the importance of vomiting as a diagnostic symptom in these cases, and he would regard it as having even more value than that attributed to it by the essayist. The vomiting in the case under consideration was probably due to the stripping of the bowel.

DR. GWILYM G. DAVIS considered intense pain and rigidity as being symptoms indicative of a grave lesion in cases of abdominal contusion. If the surgeon waits until peritonitis sets in, the evidence will of course be more positive, but the two symptoms mentioned, with possibly vomiting, may be looked upon as the earlier symptoms that are indicative of a grave lesion necessitating operation.

DR. HENRY R. WHARTON emphasized the principle of not operating in the early stages of shock. He had seen many cases appear unfavorable for a few hours, but afterwards go on to uneventful recovery. These cases of contusion are most difficult ones to decide. Rigidity and pain after the subsidence of shock are valuable in guiding the surgeon to a decision.

DR. GEORGE G. ROSS, in commenting on Dr. Le Conte's statement that he had never seen abdominal injury follow the blow of a fist, mentioned the case of a man who exhibited grave symptoms following such trauma. Operation showed that five inches of the mesosigmoid had been torn loose. The patient recovered from operation, but later died from intestinal obstruction.

DR. JOHN B. ROBERTS believed that obscurity of diagnosis in these cases makes the surgeon timid. His opinion is that we often do not operate early enough. In grave, obscure cases he would apply the same principles that govern the treatment of injuries to the skull. There the scalp is opened to inspect the skull, and if that does not suffice, the skull is opened to allow examination of the brain. In similar abdominal cases make an incision, under cocaine if necessary, that will admit of one or two

fingers, and thus allow determination of the injury present. This procedure may save many patients.

CAPTAIN CHARLES KIEFFER, U. S. A., who had seen the cavalryman mentioned by Dr. Le Conte, said that the high mortality among cavalrymen from abdominal injury was due to the fact that they would disclaim injury from being thrown, and probably not report until peritonitis had begun. He had seen three such cases. He operated upon one man who had been kicked in the abdomen and found a transverse tear of the bladder. The bladder was sutured and the patient recovered. In many cases of abdominal injury a symptom of particular value is singultus. This is especially significant of injury to the upper portion of the intestinal tract.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, January 5, 1903.

The President, JOHN B. MURPHY, M.D., in the Chair.

THE SURGICAL TREATMENT OF ANURIA.

DR. ARTHUR DEAN BEVAN read a paper on the above subject, for which see page 575.

DR. M. L. HARRIS, with reference to the classification proposed by the essayist, suggested as subdivisions primary and secondary anuria. The clinical picture of cases belonging to the two classes was quite different. In the primary anurias many of the patients were sick from the start; but in the secondary anurias patients were frequently up and around several days after the anuria begins. For six or eight days they apparently did not have anuric symptoms, and oftentimes they had a strong and full pulse.

Dr. Harris favored operation as soon as a correct diagnosis was made, or as soon as there was obstruction.

DR. D. S. FAIRCHILD (by invitation), of Clinton, Iowa, reported the history of a man who several weeks ago was admitted to hospital with apparently some renal disturbance, shortly after which he had a severe chill, with a temperature of 104° F. The day after the chill and fever it was noticed that he was not passing any urine. Two days later, the anuria having persisted, it was decided to operate. In the meantime, the right kidney was found to be considerably enlarged and quite tense. Patient apparently was suffering from uræmia. He became delirious, and in this condition was taken to the operating room, the right kidney exposed, and it was found that a good deal of inflammation had occurred about the kidney, which was firmly adherent to the abdominal wall. An incision was made in the lumbar region,

and the kidney felt much enlarged. The kidney was freely incised, but no abscess was found. But there was a suppurative nephritis going on, as indicated by the appearance of some pus on the dressings. A small quantity of urine only escaped, not from any accumulation in the pelvis, but was simply drained from the kidney. Normal salt solution was given per rectum. The next day the patient passed some urine from the other kidney, and in three or four days the quantity of urine secreted became nearly normal. The patient was making a good recovery.

While this case might not be one of the kind mentioned by the essayist, yet it was a fact that the pathological condition in the right kidney came on suddenly in this instance. He was not able to discover any disease of the left kidney, and microscopical examination of the urine made since the operation did not reveal any pus in the urine. On a previous occasion the patient stated that he had a similar difficulty, with chill and fever, during which time the urine stopped flowing, but the attack was not so severe as this one.

DR. WILLIAM JEPSON (by invitation), of Sioux City, Iowa, detailed the history of a woman, forty-six years of age, who, three years previously, suffered from some renal disturbance, the exact character of which was not known. At the time he saw her she had been suffering for eighteen or nineteen hours. There was constitutional disturbance, increased pulse-rate, but not a marked increase in temperature. Each iliocostal region was occupied by a large mass, larger than a cocoanut. She was considerably emaciated, and there appeared to be a distinct lobulation of each of the masses, which were advancing forward to the median line, so that there was not more than three or four inches between the two masses. He thought the woman had an obstruction of the ureters on both sides. At least, this was the only way of explaining the condition. He made an examination of the two masses through an abdominal incision, and found that each kidney was the seat of multiple cysts of the size of cysts of the ovary. The right kidney was exposed through a lumbar incision, and he evacuated probably forty or fifty of these little cysts. The other kidney (the left) was let alone. The patient rapidly thereafter developed symptoms of uræmia, and died the ninth day after the operation.

DR. L. L. MCARTHUR said that, in the light of Dr. Bevan's

researches, it seemed possible experimentally to produce reflex anuria. If this was possible, it would then be difficult to classify reflex anuria of that kind under the subdivisions of primary and secondary, as suggested by Dr. Harris. He thought the appropriate question was, What shall be called anuria? Must we consider an absolute anuria, that is, not a drop of urine escaping, or perhaps a few drops, as in the case reported by him at the last meeting, where no urine was to be gotten for two or three hours? Shall that be considered a case of anuria? For if there be only a few drops escaping, the differential diagnosis was far more difficult, because the surgeon might not be sure he had an obstruction, and might believe that the trouble was due to the poor functionating capacity of good renal substance without obstruction, when it might prove, as it did in the speaker's case, to be a partial or almost complete anuria, only a few drops of urine escaping. He doubted if cryoscopy would be of any assistance in a case of true hysterical anuria.

DR. THOMAS A. DAVIS stated that experiments had been made and published recently in the *American Journal of the Medical Sciences*, where the caliber of the renal veins was arrested in their lumina for the purpose of causing passive congestion of the kidney, without lessening the amount of urinary secretion. The author of these experiments concluded that the operation of nephrotomy to establish the circulation, provided the venous congestion be relieved, would not lead to an increase in urinary secretion, and that the operation was not indicated. This author spoke of it being contraindicated in anuria resulting from chronic inflammatory affections of the kidney, but said the operation should be limited to congenital anuria and to obstructive anuria from urinary calculus.

DR. BEVAN, in closing the discussion, said he could not agree with Dr. Harris in advocating immediate operation in cases of obstructive anuria, because in many instances of this form of anuria the obstruction was relieved without operation in the first twenty-four, the second twenty-four, and sometimes in the third twenty-four hours, or even as late as the tenth day. Where the obstruction of the ureter of a single functionating kidney was due to stone, the stone might be passed. One should be careful in analyzing the facts, and wait, say two days, to permit of the possible spontaneous cure of the condition by the passage of the

stone in the obstructive cases. This was the opinion of most authors who had studied the cases thoroughly, and who had had a wide experience.

In regard to the diagnosis, he said he attempted to draw a picture of obstructive anuria, showing clearly the absence of general symptoms, the general well-being of the patient shortly after the beginning of the attack, followed only quite late by marked evidence of the symptoms of uræmia.

Relative to catheterizing the ureters, he said that Israel had gone over this side of the question very carefully, and had come to the conclusion that catheterization of the ureters was of such doubtful value in these cases that it was hardly worth spending the time on, but that surgeons should proceed to do nephrotomy instead.

TRANSPLANTATION OF OMENTUM IN THE OPERATIVE TREATMENT OF INTESTINAL DEFECTS.

DR. EMANUEL J. SENN read a paper on this subject. The omentum plays a great rôle in the reparative process following traumatic injuries of the abdominal cavity, both in the destruction of microbes and protection of the general peritoneal cavity by reason of adhesions with intestines and the parietal peritoneum. While omentum transplantation is a recognized operation as a reinforcement of intestinal suture, the author was impressed with the possibility of the use of omentum for directly covering an intestinal defect. Such a pathological condition following a duodenal ulcer, intestinal tuberculosis, gangrenous cæcum, the result of an appendicitis, where enterorrhaphy cannot be resorted to, by reason of the unreliability of the surrounding tissues in withstanding tension, or where suturing would cause too great narrowing of the intestinal lumen; also where the condition of the patient or extensive adhesions would not permit an enterectomy. The omentum has been transplanted over perforations in the stomach, both in experimental work and in man.

The essayist, after referring to the work of Bennett, Braun, Tietze, Enderlen, and others, reported a series of experiments for the purpose of investigating the possibilities of omental transplantation. The experiments were done under the most favorable circumstances as regards the surroundings for doing aseptic work, but the results were unfavorable. The author stated, how-

ever, that the unfavorable results from the experiments are no criterion of the future value of omental transplantation. The omentum in the dog is thinner than in man, and the adipose tissue is not as abundant nor as vascular, therefore, not as favorable for plastic work. The stomach is apparently the most favorable portion of the alimentary tract for omental transplantation. By reason of its fixed position, the gastric movements do not place as much tension on the transplanted omentum as is the case with the peristaltic wave of the intestines. The great omentum in this region is also found near its attachment, which may also be a favorable factor. The experimental and clinical evidence is abundant proof of this fact. The cæcum is the most favorable portion of the intestinal tract by reason of its slight mobility. It lies in one of the regions most frequently attacked by pathological processes, and the future will demonstrate the adaptability of omentum for defects which cannot be closed by suture. Resection of the cæcum or a lateral anastomosis is a formidable operation as compared with omental transplantation. Primary transplantation of the omentum in gangrenous appendicitis will greatly obviate fæcal fistula, which so often follows the operation. Until more clinical evidence accumulates, showing that reliable suturing can be done, intestinal transplantation of omentum should not be resorted to unless there is abundant drainage down to the seat of suture, besides walling off the general peritoneal cavity.

The author concludes:

1. Transplantation of omentum over defects in the stomach is an established operation.
2. Transplantation of omentum over intestinal defects is recommended, but is still in the developmental stage.
3. Transplantation of omentum over defects in the cæcum is the most favorable portion of the intestinal tract.
4. Transplantation of omentum over defects in the small intestine should only be done after fixation of the segment of the intestine to the abdominal wall.
5. Gauze drainage should be resorted to, excluding the general peritoneal cavity.

DR. E. WYLLYS ANDREWS said the conclusions arrived at by Dr. Senn were exactly those which others had come to in the course of a series of experiments on animals and also from experience in operating. In the dog, after operating with the assist-

ance of Dr. Frank in using his coupler, and after using the Murphy button in demonstrations before the class, and opening the abdomen a few days later, he had more than twice lifted out of the operative field a loop of intestine with a coil of omentum wrapped around it. He said it seemed to have encircled the entire circumference of the bowel.

DR. DANIEL N. EISENDRATH said that he had had occasion, in speaking of the surgical anatomy of the omentum, to speak of its function as a protecting mother. Within the last six months he recalled a case upon which he had operated for appendicitis, where the omentum was fastened to the lower end of the cæcum, like an envelope would enclose a piece of paper, so that it had to be stripped from the lower end of the bowel. He believes that the reason for the apparent failure in conducting the experiments was, as Dr. Senn had said, namely, a difference in the construction of the human and the dog's omentum. Any one who had experimented with dogs would recall the fact that the omentum was almost as thin as tissue paper in young dogs. A point of interest was the omentum in relation to the spread of peritonitis. The omentum divided itself off into two parts,—the so-called supra-omental and the infra-omental portions,—in which suppuration from the appendix had a tendency, on account of the protecting action of the omentum, to limit itself to a portion beneath the omentum.

DR. JACOB FRANK said the omentum of a young dog was very thin, the same as it was in young children. An old dog's omentum, on the other hand, was much thicker and corresponded to that of adults.

DR. ARTHUR DEAN BEVAN could see the value of omental grafting in cases of lesions of the stomach, but he doubted very much its value in lesions of the small intestine and of the colon, with the exception of the transverse colon. He questioned the practical value of utilizing the omentum in such cases. Surgeons knew how omental adhesions might produce intestinal obstruction. Probably the most common cause of intestinal obstruction was adhesion in which the omentum was involved. If the surgeon, in a case of lesion of the transverse colon or stomach, utilized an omental graft, anatomically it was correct. If one used the omentum in a lesion of the ileum, there was great danger of furnishing a cause for subsequent ileus; and in spite of the

great value given to the omentum by many as a protecting structure, as in cases of appendicitis, for instance, he thought it was overdrawn, and the great danger attending its use should be considered.

DR. SENN, in closing the discussion, said it was very seldom a surgeon, outside of the work of appendicitis, was called upon to use the omentum for intestinal fistula. He had seen a number of cases of fistula following cases of gangrenous appendicitis, and had heard of many more; by closing in the defects with omentum, fistula might be obviated. In certain cases of tuberculosis of the intestine, where it was impossible, on account of adhesions, to do a resection, there was nothing else to do but to cover in the defect with something, and he said that in his conclusions he advised, before resorting to transplantation of omentum, first to fix the intestinal segment to the abdominal wall; then, if the omentum was transplanted, there would not be any possibility of secondary intestinal obstruction. He could see the possibility of intestinal obstruction, provided omental transplantation was made and the segment of bowel dropped back into the peritoneal cavity. But if the intestinal segment was anchored, he did not think there would be any danger of secondary obstruction.

CARCINOMA OF THE LARYNX.

DR. ARTHUR DEAN BEVAN exhibited a carcinomatous larynx which he had removed about five weeks ago. In this case he did a complete laryngectomy for carcinoma of the larynx after a tracheotomy had been made, also a thyrotomy. The carcinoma was removed at the second operation, but recurred. Complete laryngectomy was made by the Keen method, a method which he had employed in a previous case exhibited to the Society. The patient had gone on to normal recovery, with complete closure of the pharynx within about three weeks after the operation.

REVIEWS OF BOOKS.

GENITO-URINARY AND VENEREAL DISEASES. By LOUIS E. SCHMIDT, M.Sc., M.D. Philadelphia: Lea Brothers & Co.

This is one of the "Medical Epitome Series" of books edited by Dr. V. C. Pedersen. The author in his preface draws the very appropriate simile between this book, which affords a comprehensive survey within a compact space, and a landscape condensed by the camera and still preserving all the essentials in their proper place and proportion.

This little volume treats with great clearness of venereal and genito-urinary diseases and their complications. The first chapters are devoted to syphilis and chancroid. All of the other diseases are described under the head of genito-urinary affections. Particular attention is given to the remote effects and complications of these diseases. Diagnosis is also given its full quota of attention.

While the book is intended for the medical student, it may also be regarded as an index for handy reference for the general practitioner. It is no longer a heresy to say that these little books serve a useful purpose, and contain as much working information as some larger books with their verbose disquisitions, references, and all-sided views.

JAMES P. WARBASSE.

TEXT-BOOK OF ANATOMY. Edited by D. J. CUNNINGHAM, F.R.S., Professor of Anatomy and Chirurgery, Trinity College, Dublin. Illustrated with 824 wood engravings from original drawings, many printed in colors. New York: The Macmillan Company, 1902.

This book is the work of ten contributors edited by Professor Cunningham. The distinguished editor and his colleagues

were pupils of Sir William Turner, and dedicate this volume to their former teacher and master. The reverence and love which association with him inspired is thus crystallized in a volume which worthily reflects the teachings of an eminent anatomist.

In the preparation of such a work, it is difficult to preserve the symmetry and balance of the several chapters; thus, we note that some chapters are models of description and replete in detail, while others are brief and almost inadequate.

The chapter on osteology and arthrology is a thorough description of the bones and joints, supplemented by appropriate illustrations. The muscular attachments are shown by colored outline, and the diagrams are such as emphasize the text by the impressions made through the eye.

An important innovation is the emphasis which is placed upon the *architecture* of each bone,—its form, density, thickness of its walls, and adaptation to its special function.

The muscular system is not as fully described as its importance demands, nor is the function of the muscles sufficiently emphasized to impress its importance upon the mind of the student. The nomenclature is thoroughly modern and up to date. We believe that, instead of leaving the nerve supply and action to be tabulated at the end of each group of muscles, it is better to note these under the individual description of each muscle.

The description of the vascular system is, as a rule, brief and inadequate; furthermore, the text might advantageously be elucidated by appropriate illustrations of important anastomoses, such as the ovarian and uterine, and others.

The chapter on the nervous system is a model of excellence in every particular. It is a splendid description of this most complex system, well illustrated, with a proper appreciation of the important and subsidiary details. The same may be said of the chapter on the digestive system. The description of the cæcum and appendix, the topographical relations of the abdominal viscera, show important original investigations by their departure

from the conventional descriptions hitherto in vogue, and give to the book much that is valuable and new. The volume closes with a short but satisfactory chapter on surface and surgical anatomy. The few defects as noted above are more than counter-balanced by the many points of excellence, originality, and scholarly temper which pervade this volume.

WILLIAM FRANCIS CAMPBELL.

DISEASES OF THE SKIN. By ALFRED SCHALEK, M.D. Philadelphia: Lea Brothers & Co., 1902.

This little book is one of the "Medical Epitome Series" edited by Dr. V. C. Pedersen, intended to take the place of the quiz compend. Indeed, it is such an improvement upon the latter that there remains but little resemblance. The value to the student and practitioner of such epitomes has long been recognized. Such epitomization furnishes an aid to a mastery of the essentials of the subject, and serves as a basis upon which a knowledge of details can be built. These works, of course, are adapted particularly to the needs of medical students, but the practitioner need not feel above consulting them.

This particular volume sets forth the essentials of dermatology. It is made a work of ready reference by an alphabetical arrangement of subjects, which we find extending from acne to xanthoma. A brief but lucid description of the pathology of the skin and its anatomy are also given. There is also a valuable table, classifying all of the skin lesions. These come under the heads of inflammations, hæmorrhages, hypertrophies, atrophies, new growths, neuroses, diseases of the appendages of the skin, and parasitic affections.

There are thirty-four engravings. The work would be of service to more men than would be willing to acknowledge that they had any use for so small a primer.

JAMES P. WARBASE.

INTERNATIONAL CLINICS. Edited by HENRY W. CATTELL, A.M., M.D. Vol. iii, Twelfth Series. Philadelphia: J. B. Lippincott Company, 1902.

This volume is divided into sections on therapeutics, medicine, surgery, obstetrics and gynæcology, and diseases of the eye, ear, and throat. About fifty pages are devoted to surgery.

The effects of fire-arms at short range are set forth in an interesting paper by Dr. John H. Brinton, illustrated with colored plates showing the comparative effects of black and smokeless powder cartridges. The author shows that the discoloration of the skin, where black powder is used, is due to the smut from the barrel of the piece, which after repeated discharges becomes very great; to the smoke, to the heat and flame of burning gases, to partly burned powder, to the ashes of burned powder, and to the partly burned and unburned powder grains driven into the tissues. His studies of the relation of the "brand" or burn to the bullet-hole are interesting in that he has demonstrated that, without exception, the "brand" is on the side of the hole towards the right of the piece. This rule he found invariable in 200 experiments. It is explained by the recoil of the barrel towards the right. When the piece was fixed in a vise so that there could be no recoil, the bullet-hole was in the centre of the "brand." The great medicolegal importance of this knowledge is evident.

Dr. John A. Lewis has a paper on the treatment of fractures and dislocations in relation to suits for malpractice. Dr. James P. Tuttle has reported a lecture on the treatment of internal hæmorrhoids by the clamp and cautery. Dr. J. R. Pennington also has reported a lecture on hæmorrhoids.

In a lecture on the treatment of dilatation of the stomach by gastro-enterostomy, Dr. G. M. Debove, of Paris, in order to map out the stomach, administers six grammes of bicarbonate of soda and four grammes of tartaric acid to accomplish the full distention of the organ. He also calls attention to the value of percussion applied to the abdomen to cause contraction of the stomach to demonstrate its effort to empty itself.

Dr. Antonio Cardarelli has a lecture on the surgical treatment of dilatation of the stomach. He shows that gastrectasia is not necessarily dependent upon pyloric stenosis. He quotes Doyen's statement that all the severe dyspepsias, in which medical treatment has failed, belong to the domain of surgery. The author contends that as soon as simple pyloric stenosis with gastric stagnation has been diagnosed, surgery is indicated. He goes farther, and advises surgery, even if the physician is not entirely convinced of stenosis, if the stomach is not able to completely empty itself and a condition of stagnation exists. He suggests that in many cases the reason that the patient is not turned over to the surgeon is that the physician is not altogether certain of his diagnosis, and he fears that the surgeon's knife will reveal his error. He reports four cases operated upon for this condition by gastro-enterostomy.

Dr. De Forest Willard, in a discussion upon club-foot, reserves astragalectomy for (1) adults with great bony deformity, (2) neglected cases in children of from five to fifteen years with markedly distorted tarsi, (3) relapsed cases or cases which have resisted the milder forms of treatment, (4) and only occasionally in young children with persistently rigid bones, and with little motion either at the ankle-joint or in the tarsus. Astragalectomy, he says, is an operation which would never be required if the family practitioner could be brought to the comprehension that the treatment of club-foot should be commenced before the infant is twenty-four hours old. He prefers to operate without the Esmarch bandage.

Dr. J. M. Baldy's discussion upon the diagnosis of abdominal tumors is very instructive.

The studies of the theory of inflammation, by Dr. Hans Schmaus, are taken from his lecture upon this subject, and represent the newest and best knowledge.

This particular volume is richer in surgical material than many of its predecessors; and the merit of the surgical articles

is such as to enhance the total value of the work. The popularity and value of this class of books are increasing, and authors and editors are learning how to make them better.

JAMES P. WARBASE.

CELLULAR TOXINS. By VICTOR C. VAUGHAN, M.D., LL.D., Professor of Hygiene and Physiological Chemistry and Director of the Hygienic Laboratory in the University of Michigan, and FRED. G. NOVY, M.D., Sc.D., Junior Professor of Hygiene and Physiological Chemistry in the University of Michigan. Fourth edition, revised and enlarged. Philadelphia and New York: Lea Brothers & Co., 1902.

The perusal of this book in its fourth edition is to be warmly commended to surgeons for the detailed exposition of the phenomena that operate in the blood upon the introduction of bacteria in the system. These teachings are embodied in the chapters on Germicidal Properties of Blood Serum, the Specific Precipitins, the Lysins, Bacteriolysis, Hæmolysis, the Agglutinin; and a due appreciation of their significance will better enable physician and surgeon to understand what is implied in the comprehensive expression, Immunity. This latter topic is finally elaborated in a separate chapter. Whereas the evolution of immunity is very ably rendered, it is rather a synthetical representation than a narrative of the evolutionary phases that led up to its present state of development, and this reversal of order makes the subject-matter considered in Chapters v, vi, vii, and viii somewhat difficult to grasp. By this criticism, we do not in the least intend to detract from the importance of studying these innovations which to us characterize this edition from its predecessors. The remaining chapters are given over to a description of Food Poisons, Pto-maines, and Leucomaines, and a sober after-thought is expressed in the last chapter on Autogenous Disease.

MARTIN W. WARE.

A TREATISE ON MASSAGE. By DOUGLAS GRAHAM, M.D. Third edition, revised, enlarged, and illustrated. Philadelphia and London: J. B. Lippincott Company, 1902.

Upon perusal of this charmingly written book, we gather from the numerous citations of recent date that the scholarly author has been assiduous in his efforts to bring this treatise up to date. The excellent photographic illustrations aid materially to elucidate the text, in itself very explicit. We most decidedly must take issue, however, with such teaching as applying massage for the relief of intussusception and peritonitis in the acute stage; otherwise, every organ is meted out its due care at the hands of the masseur. But the author, with all his high regard for Labludowski, evidently does not endorse his plan of massage of the testicle and spermatic cord for functional impotence. We fail to find any reference to the common practice of employing massage to effect a reduction of obesity. These are but errors of omission, and in no way minimize the excellence of the judicious advice narrated with the rare grace and elegance of diction to be found in these pages.

MARTIN W. WARE.

MASSAGE AND THE ORIGINAL SWEDISH MOVEMENTS. By KURRE W. OSTROM, of the Royal University of Upsala, Sweden. Fifth edition, revised and enlarged, with 115 illustrations. Philadelphia: P. Blakiston's Son & Co., 1902.

We are assured in its fifth edition that the book has been subjected to entire revision of the text in the light of recent methods. Turning, though, to the matter of fractures, for the immediate treatment of which massage has been exploited by the French surgeons, and its beneficent effect corroborated by other schools, we find advice on this matter to be very meagre, and such remarks as are made are confined merely to the after-treatment of fractures.

The illustrations, remodelled, present in a schematic way,

very successfully, the minutiae of the various movements in the execution of massage.

The book appeals more particularly to students of massage, nurses, and physicians who would be alive to the principles of this art.

MARTIN W. WARE.

A MANUAL OF DISSECTION AND PRACTICAL ANATOMY. By W. T. ECKLEY, M.D., and CORINNE B. ECKLEY. Philadelphia and New York: Lea Brothers & Company, 1903.

The authors of this work have taken upon themselves a very difficult task, *i.e.*, the production of a manual of dissection and practical anatomy which at the same time does not claim to be a descriptive anatomy. Founded on the works of Gray and Gerrish, it assumes the possession of one of these by the reader, without which the present volume would be incomplete.

The book is divided into thirty-three chapters, each taking up a different region of the body. At the beginning of each chapter directions are given for the dissection. For the various incisions, the text is copiously supplied with figures and illustrations, to which the reader is referred. Following this there is a description of each structure to be worked out, giving the relations and important anatomical points concerning the same. Many tables are inserted, which make the book of value to one wishing to review anatomy. An especially valuable chapter is that prepared by Dr. De Lee Shaw on the Blood Vascular System, in which he presents in tables all the arteries and veins under the following headings,—name, description, branches, and distribution.

The book is well illustrated, nearly all the illustrations having been taken from the works of Gray and Gerrish.

PAUL M. PILCHER,

ANNALS OF SURGERY

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No. 5

ORIGINAL MEMOIRS.

THE SURGICAL TREATMENT OF FACIAL PARALYSIS BY NERVE ANASTOMOSIS.¹

WITH THE REPORT OF A SUCCESSFUL CASE.

BY HARVEY CUSHING, M.D.,

OF BALTIMORE,

Associate in Surgery, the Johns Hopkins Hospital.

PARALYSIS resulting from disease or injury of no other individual nerve leads to a deformity more distressing than that consequent upon the loss of function of the N. facialis.

For several years it has been known, chiefly from experimental observations, that, after the division of a peripheral mixed nerve, the transplantation of its distal severed end into the trunk of a neighboring nerve of like nature might result in complete restoration of function. In an occasional authenticated case in man, a similar anastomosis between a paralyzed and an intact nerve has resulted in recovery.* It was thus

¹ Read before the Philadelphia Neurological Society, February 24, 1903.

* This, I believe, was first conclusively demonstrated by the oft quoted case of Sick and Säger. (Heilung einer in Folge traumatischen Defects bedingten Lähmung des Radialis durch Vernähung des peripheren Endes dieses Nerven mit dem Medianus, Langenbeck's Archiv für klinische Chirurgie, 1897, Band liv, p. 271.) Sick grafted the distal stump of a paralyzed musculospiral nerve into the neighboring intact median. The patient ultimately regained perfect motor control with coördination in the groups

demonstrated that cortical impulses travelling over new paths could in favorable cases be made to reach a group of muscles whose proper neural connections had been irreparably severed, and that normal coördinated movement might result and sensory stimuli as well be properly located and interpreted.

On *a priori* grounds such a transference of functional activity from one purely efferent nerve to another would appear more simple and its accomplishment more probable than in the case of mixed nerves, conveying as they do both centrifugal and centripetal impulses. It consequently is a matter of some surprise that the attempt has not been made heretofore by many to reclaim by operative measures the sorry cases of facial paralysis by the sacrifice of a neighboring motor nerve, the loss of which would lead not only to a relatively insignificant disability, but a much less obtrusive deformity. That the spinal accessory, the hypoglossal, or a motor branch from the cervical plexus might lend itself to such an anastomosis is a natural suggestion.

Seemingly, in 1898, Dr. Faure, of the Hôpital Laënnec, made the first attempt to carry out this procedure, acting upon the suggestion of his colleague, Dr. Furet. In a patient, who for eighteen months had been afflicted with facial paralysis consequent upon a traumatic destruction of the nerve during its course through the temporal bone, an anastomosis was made between the peripheral end of the N. facialis, divided near the stylomastoid foramen, and that portion alone of the N. acces-

of muscles presided over by both nerves, the impulses travelling by way of the median alone. Since then there have been several successful cases of this comparatively simple performance.

Still more complicated procedures have been carried out experimentally. Thus there has been a successful transference or crossing between the flexor and extensor nerves of an extremity with complete return of coördinate function, the impulse calling out flexor movements travelling from the centre over a nerve originally an extensor, and *vice versa*.

Even more remarkable has been Langley's demonstration that nerves originally subserving entirely different purposes, as the sympathetic and the pneumogastric, may be successfully crossed. He has, for example, succeeded by an anastomosis in making the vagus nerve take up the vaso-motor activities of the divided and transplanted cervical sympathetic.

sorius which supplies the trapezius muscle. The operation, unfortunately, in this instance did not lead to "un résultat hereux;" but the case nevertheless was subsequently reported several times during the years 1898-1901 by one or the other of these gentlemen before the French Societies (see Historical and Bibliographical Notes) and advocated as a feasible measure. Their report by no means met with the attention in medical literature which it deserved, and the suggestion apparently was taken up by none of the surgeons interested in neurological problems.

Early in the same year, and quite independently of Foret's suggestion, Paul Manasse, working in Munk's laboratory in Berlin, instituted a series of experimental observations on nerve anastomosis (*Nervenpropfung*), the results of which were made public late in 1901. In five animals he divided the N. facialis at its exit from the skull, and made an end lateral suture between the stump of this nerve and the N. accessorius. Two of the cases may be regarded as failures, inasmuch as strands from the central end of the severed facial were subsequently found to have grown down and to have reunited with the peripheral segment at the site of anastomosis. In the other case, however, in which this did not occur, the straightening of the animal's face, with evidence of some motor control of the paralyzed side, the return of faradic excitability, the subsequent histological demonstration of the continuity of nerve fibrils between the two nerves across the line of suture, and the contractions in the facial muscles brought out after recovery by exposure and stimulation of the N. accessorius central to the point of anastomosis, furnished evidence sufficiently conclusive of the partial, if not complete, success of the venture.

At the same time a somewhat similar piece of work under the acknowledged stimulus of Foret's suggestion was carried out in the Otorhinological Institute of Naples by Barrago-Ciarella, the results of which were published in Italian, anticipating by a few months Manasse's paper. Three seemingly successful anastomoses were performed by him on dogs, with the return after a few months of normal electrical excitability

and voluntary motion. The central end of the divided spinal accessory was utilized in two cases and of the vagus in another. The author modestly concludes his interesting paper as follows: "Nei cani la sutura del moncone centrale dell' accessorio o del vago previamente resecati, col moncone periferico del facciale alla sua volta reciso, è suscettibile, se immediatamente eseguita, di ripristinare la funzione nei muscoli dallo stesso facciale innervati." It must be confessed, however, in the absence of a post-mortem and histological study of these cases, and in consideration of the difficulty experienced by others in preventing reunion of experimentally divided nerves, that there is a possibility that re-establishment in continuity of the facial fibres may have occurred in these dogs.

The single instance in which the particular anastomosis under discussion has been successfully carried out on man was communicated to the Royal Society in November, 1900. Early in the preceding year, Robert Kennedy, in Glasgow, as the direct outcome of his valuable experimental work on the restoration of coördinated movements after nerve crossing, divided the N. facialis for the relief of a case of severe facial spasm, making an immediate suture between the peripheral divided end of the facial and the N. accessorius, the latter nerve having been incompletely severed at the site of anastomosis. As the result of this operation, there was at the time of Kennedy's report almost complete restoration of function in both groups of muscles temporarily paralyzed at the operation by the section of the seventh and eleventh nerves. His post-operative observations on this case demonstrated that the N. accessorius alone ultimately served as the path for transmission of impulses to both motor territories.

Unaware that there was any literature on the subject of spinofacial grafting, the suggestion for such an operation came to the writer through cognizance with Langley's experimental work on the transference of nerve function after anastomosis between the vagus and sympathetic. On the 12th of May, 1902, the case of traumatic facial paralysis here reported was operated upon, the proximal stem of the divided N. accessorius

being transferred *in toto* into the distal end of the injured and paralyzed facial. Within four months, evidence of returning control of the paralyzed muscles was appreciable, and at the time of this writing, six months after the suture, a condition approaching the normal has been re-established.

As far as I have been able to learn, Faure's unsuccessful case some months after a traumatic lesion and Kennedy's case of intentional division and immediate anastomosis with favorable result are the only instances in literature in which this procedure has been heretofore recorded.

The history of the writer's case is as follows:

The patient, a young man thirty years of age, was brought to the hospital by Dr. Ellis, of Elkton, on the 29th of March, 1902. He had received, some hours previously, a bullet wound from a .38-caliber revolver held close to the skull and discharged just behind the right ear. When first seen by the attendant soon after the injury, it was noted that there was a ragged wound of entrance at the situation of the mastoid process, and that the patient had a complete paralysis of the right side of the face. At no time was there loss of consciousness or any other symptom indicative of intracranial mischief.

Soon after his admission to the hospital, the grimy wound was thoroughly cleaned out by Dr. Mitchell and the bullet extricated from the base of the skull, where it was found mushroomed and firmly lodged in the bone. The missile had passed from behind forward through the anterior part of the mastoid process, destroying in its course the lower part of the Fallopian aqueduct and facial nerve, the tympanum and middle ear, and disorganizing to an uncertain extent the petrous portion of the temporal bone. It was evident that the N. facialis had received an irreparable injury, and was missing for a considerable portion of its course between the stylomastoid foramen and the ganglion geniculatum. A careful examination a few days later showed that the perception of taste for sweet, sour, bitter, and acid substances was abolished over the anterior two-thirds of the tongue on the right side. Motor paralysis was complete in the right side of the face and in the platysma as well, all of the muscles giving the reaction of degeneration. Bell's sign, the rolling up of the eyeball on

attempted closure of the eye, inability to distinctly pronounce the labials, lachrymation, and the other many discomforts attendant on the condition of facial palsy were present. Some hearing, to bone conduction alone, was preserved in the right ear.

It was determined to await the healing of the wound and then to make some effort to restore the motor control of the face by nerve anastomosis, and many dissections were made in the interim with this end in view. The N. accessorius was chosen as the nerve which lent itself most favorably to this procedure.

Not until the 12th of May, six weeks after the injury, when the postauricular wound had completely closed, was it deemed advisable to undertake the operation for which perfect healing seemed a *sine qua non*. By this time the patient's face had become, even during repose, much drawn to the left, and an effort to close the eye would result in the peculiar grimace characteristic of facial paralysis, with tilting up of the eyeball as shown in the photograph (Fig. 2). The sense of taste over the anterior two-thirds of the tongue had by this time largely returned, although the reaction time for the recognition of most substances was considerably slower than on the left side. His condition otherwise seemed unchanged.

May 12, 1902. Operation. Ether Anæsthesia.—The anatomical landmarks of the operative field are sufficiently well indicated in the accompanying sketch (Fig. 1), and the line of incision along the anterior border of the sternomastoid is shown by the cicatrix in one of the photographs (Fig. 3).

The N. accessorius was readily located and exposed at its point of entry into the posterior surface of the sternocleidomastoid muscle about five centimetres below the mastoid tip. The nerve consisted of one trunk, and was not split into two portions as is often the case, and as is indicated in the drawing (Fig. 1). The nerve thus exposed was not divided nor freed from its bed until the N. facialis was similarly brought to view, in order properly to estimate the length of each trunk which was requisite for suture without tension. The facial was exposed by incising the posterior border of the parotid gland in a line parallel to and directly under that of the original skin incision. Previous observations on the cadaver had demonstrated that this was a simpler method of locating the nerve than by making a deep search for the main trunk posterior to the gland. One of the two chief branches of

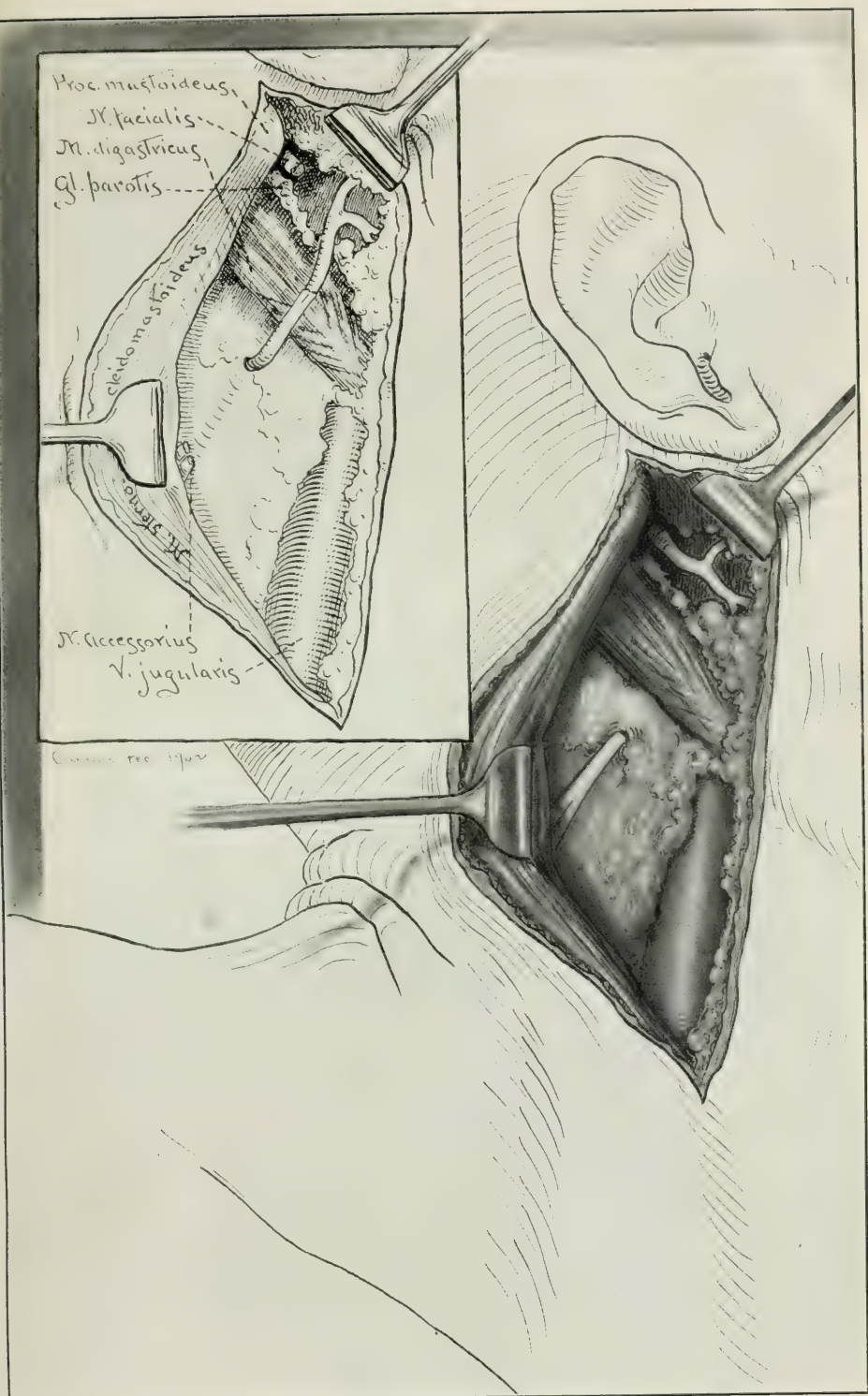


FIG. 1.—Sketch showing the anatomical landmarks of the operative field. Actual size. Outline drawing in corner indicates the position of the nerves after division and suture.

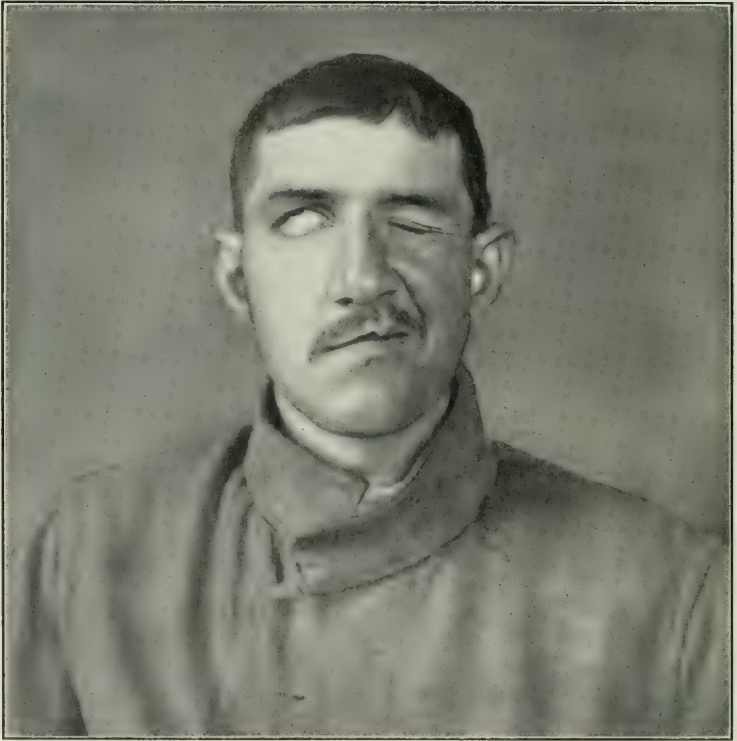


FIG. 2.—Photograph taken May 2, shortly before the operation (six weeks after reception of injury). Showing characteristic appearance on effort to close eyes. Note rolling up of eyeball, with no inhibitory droop of levator palpebre superioris whatever. At this time, even during repose, the nares and mouth were markedly drawn to the left.

bifurcation is certain to be encountered and without injury if the incision is carefully made, and this branch can then be delicately followed back to the main trunk by blunt dissection without isolation of the nerve or the exertion of trauma which might jeopardize the success of the suture.

The facial thus exposed was squarely divided as near as possible to the scar tissue occupying approximately the site of the stylomastoid foramen. For ease of subsequent handling, a delicate split silk suture was passed through the perineural sheath of the nerve just distal to the point of proposed division. The spinal accessory was similarly handled and divided close to its point of entry into the muscle. Both nerves were dissected out together with some of the loose perineural connective tissue, only far enough, however, to enable them to be brought together over the posterior venter of the digastric muscle (see corner sketch, Fig. 1). Thus transplanted, the sheaths of the nerve stumps were sutured together at three points by means of fine curved intestinal needles threaded with the most delicate strands of split silk.

The suture looked well, the nerves remaining well approximated end to end without tension. The incision in the parotid was drawn together with three fine sutures so as to cover again the facial nerve. Complete hæmostasis had been observed throughout, as shown by the absence of blood staining of the tissues at the termination of the operation. The wound was closed with a subcuticular silver-wire suture. The healing left nothing to be desired, a barely perceptible scar representing the line of incision (Fig. 3).

Subsequent History.—Within a day or two after the operation, the patient insisted that some power of motion had returned in the eyelid, rendering its partial closure possible. In the early morning hours, after a night's rest and while lying on his back, this was especially noticeable, and it had not previously been observed. It is, of course, impossible that this could have been anything more than an inhibitory action on the part of the M. levator palpebræ superioris which was mistaken for a voluntary contraction of the M. orbicularis (pars palpebralis).* On the

* Kennedy (*loc. cit.*) noticed similarly in his case on the seventh day "that there was a very slight movement of the upper eyelid possible." I cannot believe that the transmission of motor impulses could have taken place so soon after section and suture of a nerve. Although it is not

day after the operation the patient also announced that he was no longer troubled with lachrymation, and that for the first time he could read without the annoyance of an overflow of tears; that he was less troubled with saliva, and was better able to dislodge food from his flaccid cheek. I am at a loss to explain these early subjective assurances of improvement.

On the tenth day the patient returned to his home with a small galvanic battery, and the early return of function and steady improvement in his condition are largely attributable to his perseverance in continuing his daily electrical treatment and his later exercise of the muscles before a mirror.

The notes concerning his period of convalescence, owing to infrequency of examinations, are of necessity more or less random ones.

May 25, 1902 (13 days). The patient still insists on great subjective improvement in motion of the eyelid, in diminution of lachrymation, in ability to dislodge food from his flaccid cheek; does not lose saliva and liquids from corner of mouth; can eat with fork for first time without soiling. The face while at rest certainly appears much less asymmetrical. The upper lip, previously pulled far to the left, is much less drawn. There is no evidence of "contracture" of paralyzed muscles. The palpebral cleft seems considerably less wide. At present, on attempted closure of the eye, the lower edge of the iris is completely hidden, unlike the earlier condition shown in Fig. 2.

August 1, 1902 (81 days). Patient seen at his home. Marked improvement. Facial asymmetry at rest hardly noticeable. There is considerable voluntary motion in the orbicularis (pars palpebralis) and a slight voluntary twitch of the lower lip at the

spoken of in the descriptions of injury to the facial nerve, it is not uncommon to see in cases of complete paralysis a considerable and seemingly active droop of the upper lid associated with the voluntary effort to close the eye. This movement doubtless is due to the inhibition in the activity of the third nerve supplying the levator of the lid, a muscle which normally tends to keep the eye open, and which presumably is always relaxed during voluntary closure of the lids. Sherrington has demonstrated experimentally that such an inhibitory action always occurs during motion, in the passive one of two antergic muscles.

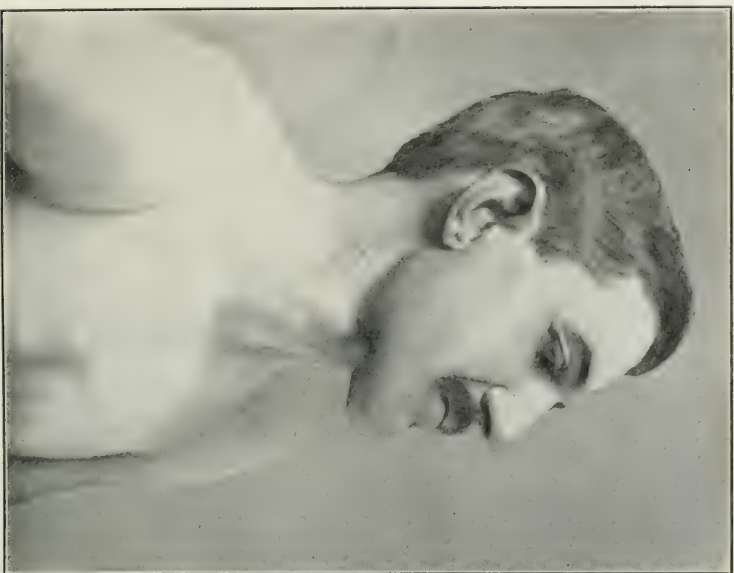


FIG. 3.—Showing line of incision. Effort to close eye without associated movement of shoulder.

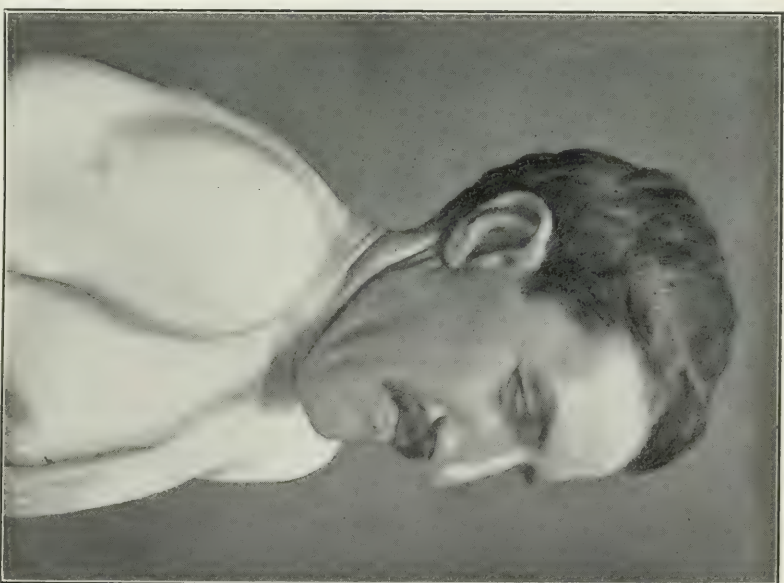


FIG. 4.—Further closure of eye and deepening of nasolabial sulcus on elevation of shoulders combined with voluntary expressional effort.

Photographs taken September 15 (127 days).

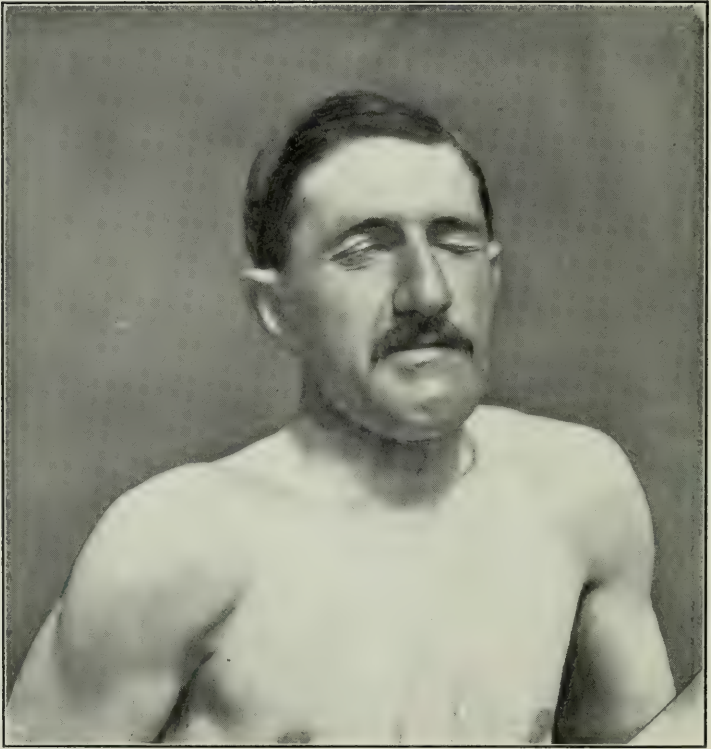


FIG. 5.—Photograph taken September 15 (127 days). Shows extent of closure of eye on partially combined effort. Eyeball rolls up.

corner of the mouth. [It is interesting to compare Kennedy's case in which the absence of asymmetry during repose (123d day) was among the first noted signs. Indication of power to make voluntary movements (172d day) and a slight movement at the angle of the mouth (190th day) are much later, but in the same sequence as in my case.]

September 1, 1902 (112 days). By letter. Announcement that since the middle of August (the 15th would have been ninety-five days) there has been a rapid improvement. According to direction, he had been galvanizing the muscles, watching his face meanwhile in a mirror, when he noticed, to his surprise, that on moving his shoulder he could bring out considerable contraction in some of the paralyzed muscles. "When I wish to laugh straight, I can help it out with my shoulder."

September 15, 1902 (127 days). Examination. (Photographs Figs. 3, 4, and 5 taken on this date.) At rest there is very slight visible deformity. The palpebral cleft is considerably wider on the right, and the absence of winking and slight droop of the lip betray the condition, though the median line of the face is no longer distorted. There is considerable voluntary control over some of the facial muscles, and this is very much exaggerated when the patient shrugs his shoulders. There is practically no co-ordination, the muscles, which have regained some power, moving all together very slightly and only on great effort unless the associated shoulder action is called out. Elevation of the shoulder alone is impossible without producing a strong contraction of the recovering facial muscles, and this contraction is sustained as long as the shoulder is held up. There is considerable power in the orbicularis, though the eye cannot be voluntarily closed even with the help of shrugging (Fig. 5). Bell's phenomenon persists. The nasolabial muscles are also responsive to volition, and the nasolabial fold is well marked during their action. It is not present during repose, showing absence of contracture.

The sternocleidomastoid and trapezius are paralyzed and give the reaction of degeneration. The patient is in no way troubled by the shoulder droop.

Electrical Examination. Galvanism.—The muscles on the right side all react to direct stimulation somewhat more lazily

than on the normal side. Indirect. Over the cicatrix on the right side, two and one-half centimetres below the mastoid process, galvanic stimulation with a moderate current gives a strong, fairly prompt contraction of all facial muscles, but elicits no response whatever in the sternomastoid or trapezius. Stimulation of the corresponding point on the normal side calls forth only a sharp contraction in the latter muscles. Galvanism of the individual branches of the pes anserinus on the right failed to elicit any contractions in their motor territories, whereas on the normal side the usual lightening contractions were readily evoked.

Faradism.—Normal responses on the left. No response whatever by direct or indirect stimulation on the right. (It is noteworthy that Kennedy observed some reaction to the faradic current as early as the forty-ninth day, although no voluntary movements were appreciable until the 172d day.)

October 6, 1902 (147 days). Seen at his home. Very slight contraction in occipitofrontalis noticed for first time. Winking reflex present, though very slight and associated with rolling upward and outward of the eyeball. Palate not symmetrical; on phonation the left arch is higher and narrower than the right.

October 27, 1902 (168 days). Photographs (Figs. 6-11) taken on this date. Considerable improvement. Facial asymmetry at rest, barely appreciable. Some coördination of expressional movement is present. Patient can to a slight extent dissociate movements of eye, nose, and mouth. Considerable freedom of facial movement without calling forth shoulder action. Reverse not the case. Eye cannot be quite closed by voluntary effort (Fig. 7). Whistling impossible as yet, but lips can be puckered to some extent (Fig. 8). Pronunciation of labials perfect. Contraction of platysma possible (Fig. 7). Elevation of arm and shrugging of shoulder still call forth general contraction of facial muscles which cannot be controlled, and which is sustained. The mere elevation of the arm, held supported without effort on the patient's part, causes some contraction of the face which he is unable to relax (Fig. 9). With the arm in this position, however, extreme voluntary effort on the patient's part to contract the facial muscles increases the action already called forth (Fig. 10). If in addition to this the support is removed from the arm

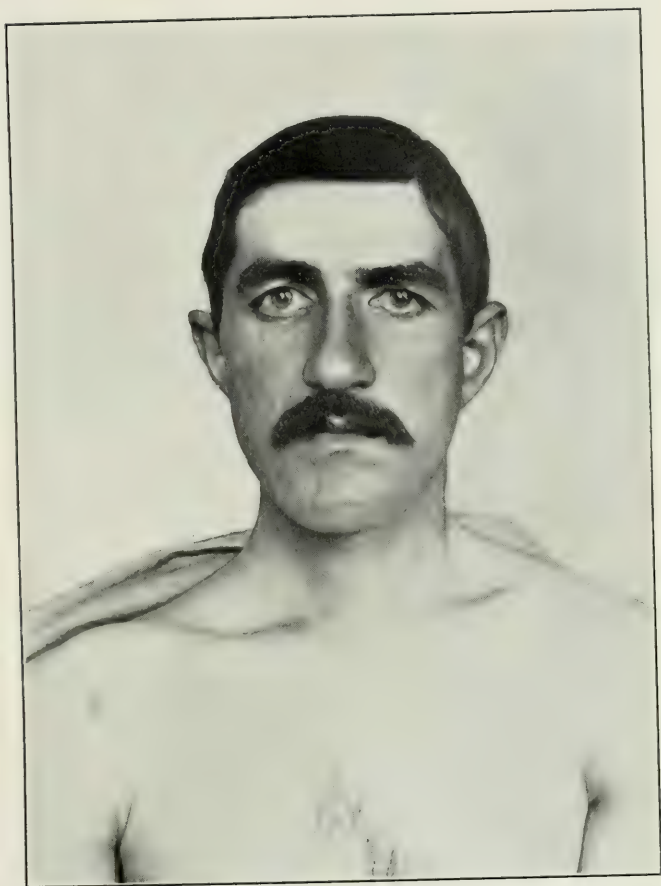


FIG. 6.—October 27, 1902 (168 days). At complete rest. Only evidence of facial asymmetry shown in slightly wider palpebral cleft on right and in slight droop of lip on same side. Note prominence of clavicle and droop of shoulder.

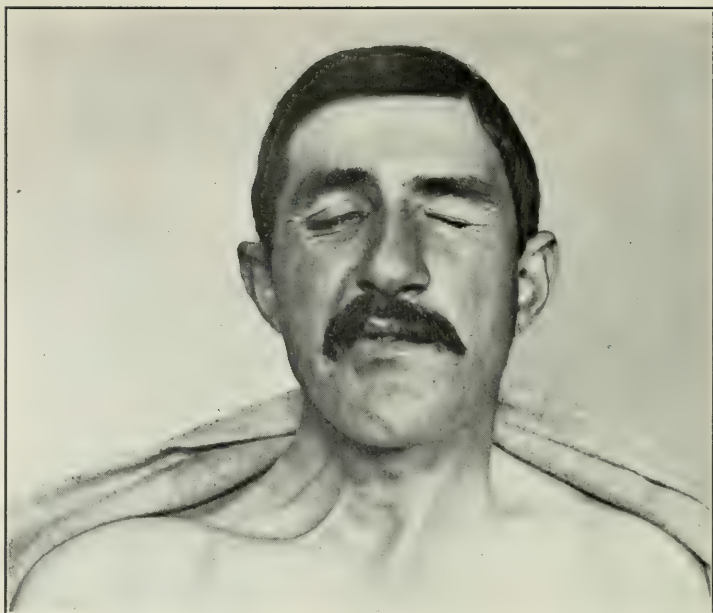


FIG. 7.—October 27, 1902 (168 days). Effort to close eye. Note that cöordination is far from perfect, as nasolabial muscles, platysma, etc., are called into play, as well as orbicularis palpebrarum on opposite side. Improvement over condition of 127th day, as here no elevation of shoulders is associated. Note contraction of platysma. Palpebral cleft remains slightly open.



FIG. 8.—October 27, 1902 (168 days). Effort to whistle. (Note that day was dark and exposure long, requiring a very tiring effort.) Cöordination perfect, as no other expressional muscles are called into play. Slight prominence of left ala of nose and slight narrowing of left palpebral fissure during this effort.

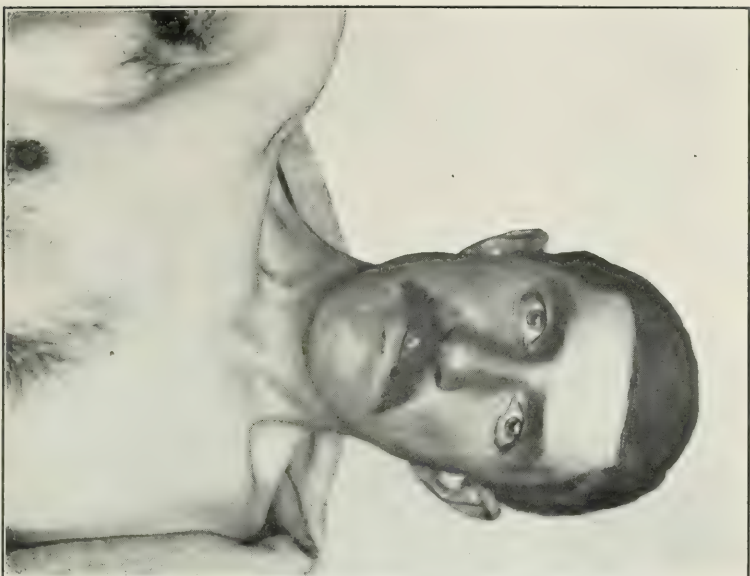


Fig. 9.—Arm completely at rest on support. No volitional effort whatever, and yet face is somewhat drawn.

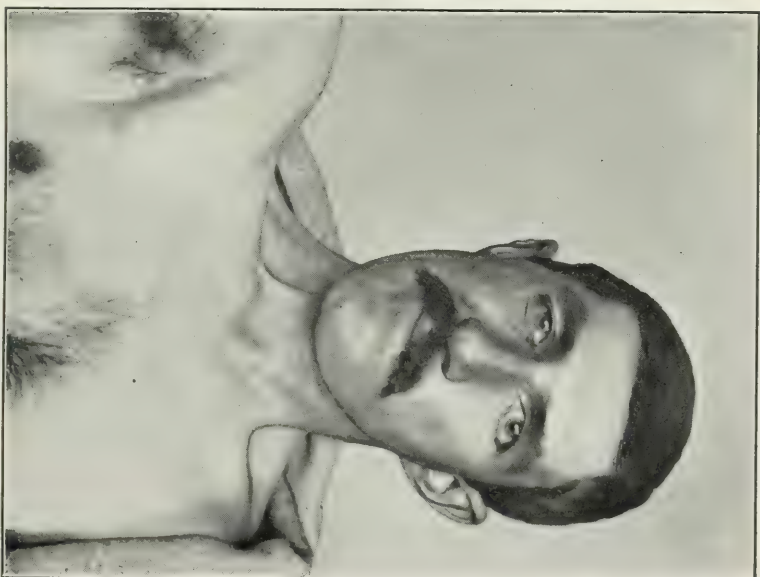


Fig. 10.—Arm completely at rest and with position unchanged; slight volitional effort to contract facial muscles in addition.

Photographs taken October 27, 1902 (108th day).

Figs. 9, 10, and 11

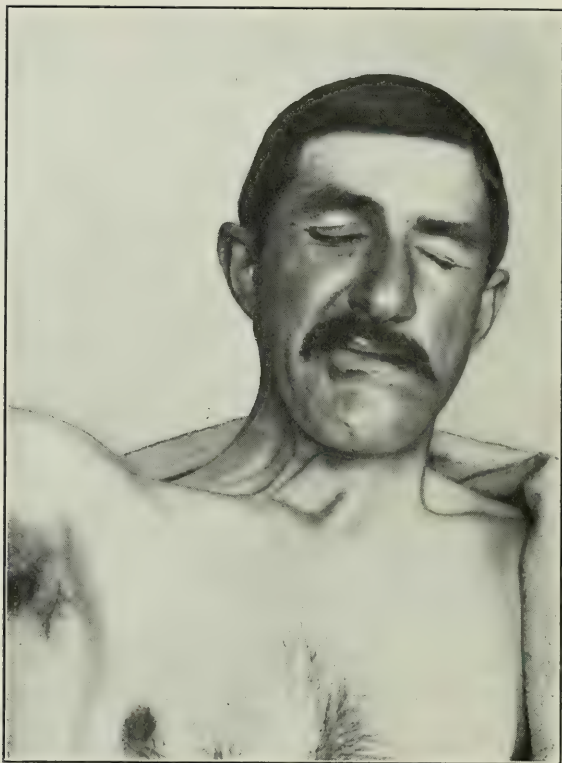


FIG. 11.—(Contrast with Figs. 9 and 10.) Support removed from arm but elevated position maintained. Note shadow of omohyoid on right and paralysis of sternocleidomastoid. Voluntary effort to close eye superimposed on the involuntary facial contraction. Closure of lids not quite complete even under these circumstances.

and the patient make the exertion to keep it in the same position, the exaggerated contraction shown in Fig. 11 is superimposed on the volitional one. Even then the eye cannot be tightly closed. Further examination of the palate shows that the uvula deviates to the left of the median line, that is, towards the normal side. On phonation this asymmetry is still more marked, the palate arches much higher on the left than on the right, and the space between the uvula and the pillars of the fauces narrows on the left and widens on the right.*

The winking reflex is present to a very slight degree. Touching the lash on the right causes an active closure of the left eye, and only very slight movement of the right lid, little more, in fact, than the inhibitory movement of the levator palpebræ heretofore mentioned. The eyeball still rolls upward and outward on volitional closure of the eye.

Taste, much as at last examination, with some retardation of reaction time on the right, though there is perfect recognition of the four taste qualities. The coppery "electrical taste" from faradism of the tongue is much less apparent on the right. Taste over the posterior third of the tongue and on the palate is apparently unimpaired; alike on the two sides.

Electrical Examination.—As at last note with following differences. Indirect galvanic stimulation from the branches of the pes anserinus now gives good reaction in the various muscles. Direct stimulation of muscles with the weakest current which elicits contractions on the normal side contracts the orbicularis. A stronger current necessary for other muscles in which the reaction still remains somewhat lazy. Response to faradic current directly applied to muscles observed for the first time as a fairly strong contraction in the orbicularis palpebrarum, though slight in the other muscles. No response from the nerves obtainable. A slight constant fibrillary action observable in the orbicularis oris and palpebrarum.

* How much stress may be laid upon this as an argument which favors some seventh nerve supply to the palatal muscles I am unable to say. In case of extirpation of the ganglion of Gasser, I have frequently seen a similar evidence of weakness on the paralyzed side, previous examinations showing a symmetrical palate. Examination of many cases supposedly normal has shown such a deviation to exist without paralysis of either the seventh or fifth nerves.

December 5, 1902 (207 days). Considerable improvement appreciable, though patient has entirely neglected exercises during past month. Coördination of individual movements of expression better, without calling other muscles into play. It is still impossible to move head to left (action of *M. sternocleidomastoideus*) or to elevate shoulder without calling facial muscles into action. In case of shoulder elevation, however, face can subsequently be almost completely relaxed.

McCarthy's reflex observed for the first time as a slight contraction in lower lid following a tap on the occipitofrontalis. In this muscle itself there is and always has been a sharp contraction with elevation of the eyebrow following a tap on the forehead. This reaction from the degenerated muscle is more marked than on the other side.

Closure of the eye is accomplished with considerably less effort. A unilateral closure on the right, however, is impossible. The bilateral winking reflex brings out a movement of the right lid more marked than heretofore. The eyelids on the side of injury meet in an S-shaped curve instead of a straight line when closed, and at the inner canthus closure is not quite complete unless associated shoulder movement is brought into play.

Electrical reactions show the greatest improvement. As before, the muscles react directly and indirectly to galvanism. Stimulation of the main stem of the facial at the point of anastomosis gives a quick and active contraction of all the facial muscles together. The dislocation of the facial trunk by the operation is shown by the fact that no corresponding point can be found on the normal side, stimulation of which calls forth contractions in both the upper and the lower divisions of the nerve at the same time. A good reaction is now obtainable by direct stimulation of the various branches over the parotid region.

An indirect response to faradism observed for the first time on this date. A powerful contraction of whole side of face at once, obtained from a point about on a level with the angle of the jaw over the cicatrix at the anterior border of the sternomastoid. Corresponding point on opposite side only gives response in trapezius and sternomastoid.

Contraction of individual muscles to direct stimulation with faradic current more marked than at last note, but still feeble.

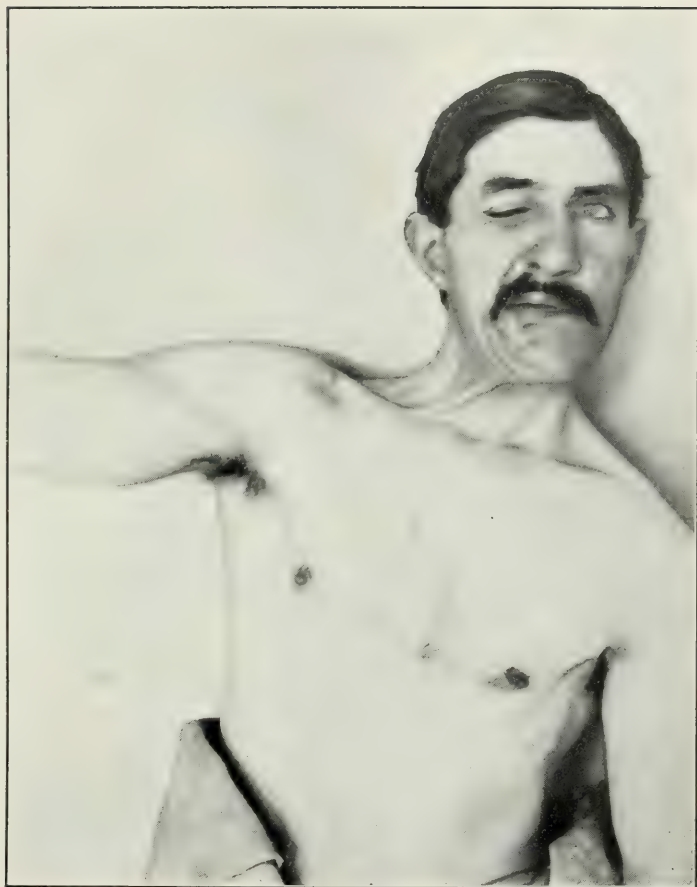


FIG. 12.—(287 days.) Involuntary contraction of the face produced by sudden vigorous elevation of arm and shoulder. Note complete closure of eye, and compare with Figs. 5 and 11.



FIG. 15.—(287 days.) Involuntary contraction of the face from sudden and vigorous rotation of the head.

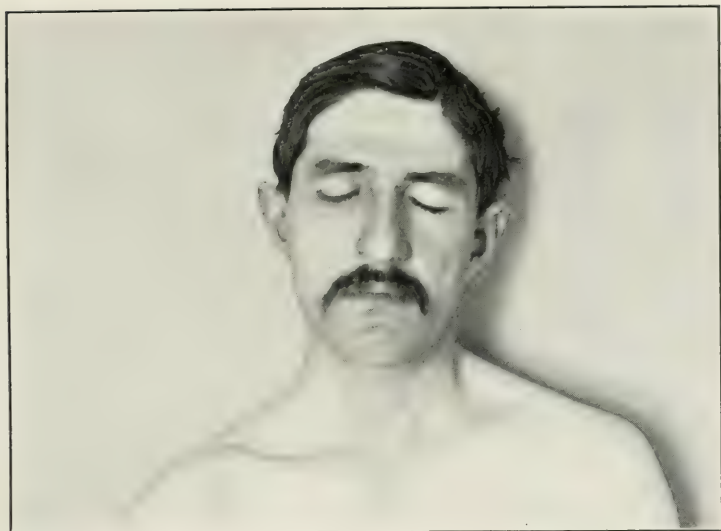


FIG. 14.—(287 days.) Symmetrical closure of eyes without associated shoulder movement or contraction of other facial muscles. Perfect symmetry of lips while at rest. Compare Fig. 4.



FIG. 15.—(287 days.) Fairly symmetrical puckering of lips in effort to whistle, without other associated movements in face or shoulder.

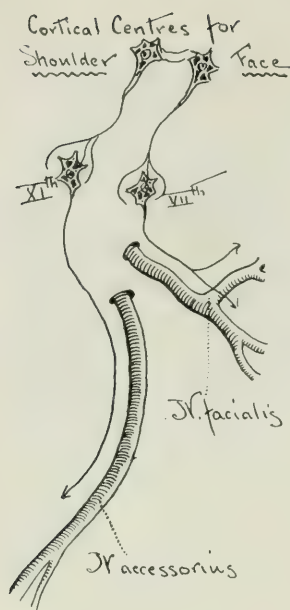


FIG. 16.—Diagram of normal relations of facial and spinal-accessory nerves showing their central connections and paths for efferent impulses.

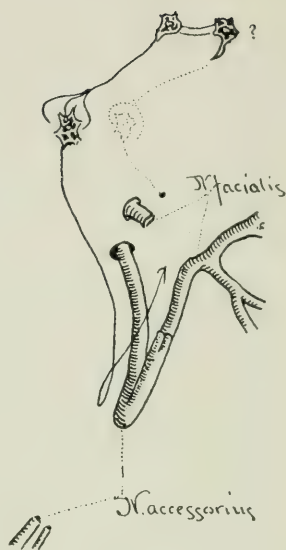


FIG. 17.—Anastomosis by procedure of Létievant as carried out in writer's case. Passage of efferent impulses to facial muscles shown by arrow. N. accessorius abandoned. Anastomosis made superficial to posterior belly of digastric muscle.

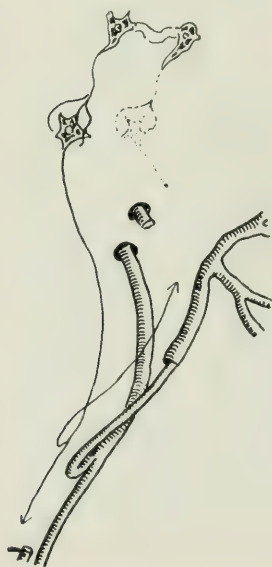


FIG. 18.—Anastomosis as performed by Faure preserving the branch of the N. accessorius to the M. sternocleidomastoideus.

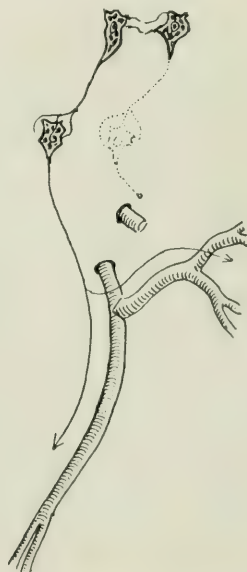


FIG. 19.—Anastomosis as performed by Kennedy by lateral graft, preserving N. accessorius supply to muscles. Anastomosis made behind posterior belly of M. digastricus.

February 23, 1903 (287 days). The electrical reactions on this date are found to be practically normal to faradic and galvanic stimulation, whether applied directly to the muscles or indirectly through the nerves. The same strength of current elicits corresponding contractions on the two sides, the only difference being in the greater ease with which the main trunk of the facial is found on the operative side, owing to its more superficial position.

A violent elevation of the shoulder which would normally call the trapezius into play still contracts the entire facial group of muscles (Fig. 12), and also a vigorous rotation of the head to the left, a movement which would normally be aided by the right sternomastoid, has a similar distorting effect (Fig. 13). Motions of less vigor, however, are possible without producing any accompanying contraction of the muscles of expression.

Individual coördinate movements are under much greater control than at the last examination. The eye can be kept almost completely closed without effort (Fig. 14), and the attempt to whistle shows comparatively little difference in contraction of the two halves of the buccinator (Fig. 15).

Thus, volitional control of individual groups of muscles has returned and can be effected without associated shoulder movements or contraction in the other facial muscles. Emotional expression, however, has not improved in corresponding degree, and as yet it is associated with considerable asymmetry.

The Surgical Procedure.—The simplicity of the problem offered by this particular lesion permits of the adoption of the simplest form of nerve anastomosis as originally proposed by Létiévant. In this form a given nerve with normal central connections is completely divided and its peripheral distribution abandoned as being of comparative unimportance. The central end of this nerve is then brought in its entirety into connection with the peripheral end of the nerve considered of greater importance, but whose central connections have been destroyed (Fig. 17). Other forms of anastomosis also are adaptable to this procedure, the methods employed by both Faure (Fig. 18) and Kennedy (Fig. 19) being somewhat different from my own. Had I been aware of these previous operations, I doubtless would have attempted, likewise, to save a

portion of the nerve supply to the sternomastoid and trapezius. Familiarity, however, with spinal-accessory injury, which almost invariably follows complete "glands of the neck" operations, has bred possibly a too great contempt of the ensuing paralysis, and I had no hesitation in producing the relatively trifling disturbance due to the shoulder droop, in the hope of reclaiming the face. At present, with the knowledge of Faure's failure and of the more pronounced associated shoulder and facial movements, which persisted in Kennedy's case, it seems possible that the complete division of the nerve and abandonment of the M. cucullaris and M. mastoideus may be the better plan. Whether or not normal coördination of expressional movements would in the long run be more likely to follow when there is a complete disassociation of shoulder movements from impulses passing along the same nerve, must remain a problem for time and the study of late results to determine.

Upon matters of technique, it is unnecessary to dwell. The procedure is a delicate one, and the probability of success will depend largely upon the delicacy with which the nerves are handled, upon the accurate approximation of the nerve stumps with the least possible suture material and that placed only in the nerve sheath, upon absolute hæmostasis, and upon the care with which the tissues lining the wound are handled, since it is of the utmost importance that there be a minimum of cicatricial formation. The degree of invisibility and softness of the cicatrix may be taken as an indication of the probability of a successful outcome, since the absorption and organization of blood-clot and of small areas of necrosis with the resultant contraction of new formed tissue is an element which more than any other interferes with the regeneration of an injured or divided nerve.

On purely anatomical grounds, as can readily be understood, this operation is especially suited to those cases in which a lesion of the facial has occurred proximal to the stylomastoid foramen, and, fortunately for the sake of operative repair, it is in this interosseous portion of its course that the nerve is most susceptible to injury whether from disease or traumatism. The

procedure only under exceptional circumstances could be adaptable to cases in which the nerve has been injured peripheral to its point of bifurcation.

The length of time which may elapse after the reception of an injury to a motor nerve and still allow of restoration of function through nerve anastomosis is necessarily uncertain and dependent entirely upon the condition in which the muscles have been kept by massage and electrical exercises. In case there has been complete atrophy of the muscles, so that they no longer respond to galvanic stimulation, probably no hope can be entertained of their recovery. Consequently, should there be any doubt of the completeness and permanency of the lesion, as in the frequent paralyses following otitis media in children, or the severe types of Bell's palsy in the adult, the muscles should be kept in tone by daily galvanism for the number of months during which it may seem advisable to await a possible regeneration without operative intervention.

In cases of undoubted destructive lesions, as in Faure's case and the writer's, the operation, of course, should be done at the earliest possible moment. The failure in the former case was undoubtedly largely due to the long interval, namely, eighteen months, which elapsed between the injury and the operation. An operation such as Bloodgood successfully performed in one instance by exposure and suture in the Fallopian canal of a nerve previously injured in a mastoid operation would, except under most favorable circumstances, be difficult in the extreme, and the procedure would hardly be applicable for the cases in which anastomosis is proposed.

As far as the nerve itself is concerned, a reasonable delay in the operation need alter in no respect the prognostic favorability of the case. Clinical experience as well as the researches of Howell, Bethe, Ballance, and others shows that there is some change, whether a true regeneration or not, which takes place in the peripheral portion of a divided nerve and puts it in a state of readiness most favorable for an early return of function after reunion by suture. It must be remembered, also, that cases of suture of individual nerves have resulted in return

of function, though the operation has been done some years after the original injury.

It is naturally of some interest to consider in what way restoration of cortical control is brought about in transplantations of this kind. That undiminished strength and power of coördination will return to a group of muscles after section and suture of their controlling nerve is a common observation. It is inconceivable, however, that the divided ends of each individual nerve fibre should once more unite in the process of regeneration by perfect coaptation. Supposedly each fibre is represented by a motor cell in the central nervous system so that it is presumable, under the readjustment of healing, that the individual cells make connection with new groups of muscle fibres. Under these circumstances there is on the part of the individual, during the slow period of motor return, an unconscious effort to coördinate the early movements, which by training leads to a perfect result. In case the nerve is grafted into an entirely different motor territory, the problem of functional restoration becomes much more complex, and the training of coördination would supposedly be correspondingly difficult. Return of well coördinated movement nevertheless seems experimentally to have been as rapid in cases of nerve anastomosis as in those of simple nerve division. Probably the age of the individual is a most important factor, and without doubt the younger the subject the more favorable is the prognosis after nerve anastomosis, especially in case muscles with such an elaborate coördinate action as those of facial expression are concerned. It is natural that especial difficulties would be encountered under such circumstances, owing to the complex emotional nature of facial movement.

It is interesting to speculate as to whether volitional impulses, in case of a successful spinofacial anastomosis, are transmitted by way of the original facial centres in the motor cortex, passing thence to the centres presiding over shoulder movements by way of commissural tracts, or, on the other hand, whether impulses pass directly to the muscles of expression

through the cortical centres once controlling movements which bring the sternocleidomastoid and trapezius into play. In the latter case the original facial centres would be entirely thrown out of the new mechanism of transmission. Doubtless faradization of that part of the ascending frontal gyrus, wherein lie the motor cells of the higher system of neurones connecting the cortex with the N. accessorius centres in the upper part of the spinal cord, would elicit movements of the facial muscles. It is inconceivable, however, that such a complex performance as the calling out of expressional movements should come, especially in an adult, so readily under the control of cortical cells originally presiding over such relatively simple actions as those which the trapezius and sternomastoid represent. The very extent of motor cortex which corresponds with facial movements in comparison with the circumscribed shoulder area would argue against the possibility that the latter could assume the function of the former, and it is difficult to believe that the original facial centres do not continue to exercise motor facial control, although the impulses must travel thence by commissural fibres to the cortical centre for shoulder movements, and so to the upper part of the cord, the N. accessorius, and ultimately to the facial *via* the point of grafting.

It is true that Kennedy has apparently proven in his experimental cases of crossed anastomosis on dogs, in which an interchange of function was established between the flexor and extensor nerves of an extremity with ultimate restoration of coördinate motion, that subsequent cortical stimulation of the flexor centre provoked extensor movements and of the extensor centres flexor movements. It is conceivable, however, that, although the major effect of stimulation of one centre, the flexor, for example, was to call forth extensor movements, the flexor centre may still have had some less apparent control over flexor activities through connecting fibres with the extensor centre. In his experimental conditions this could hardly have been demonstrated by electrical excitation of the cortex.

In my patient, for example, when an incoördinate contraction of all of the facial muscles on the side of anastomosis

was occasioned by a forcible elevation of the shoulder or arm or by rotation of the head, volitional and more or less properly coördinated movements of expression could be superimposed on this involuntary underlying reaction, as though the facial centres had some regulatory control of expressional movements over and above the incoördinate action newly assumed by the centres which originally governed motion in the spinal accessory pair of muscles.

The dog's cortex is hardly a favorable one for such observations, owing to the circumscribed extent of the motor territory; and I am unaware that any studies on the higher apes have been made with the object of determining the motor responses to cortical stimulation after nerve transplantations.

The course of these impulses after an anastomosis such as has been described can consequently only be conjectured, and it seems that there are two possible hypotheses:

1. That the cortical centres concerned in shoulder movements (trapezius) and rotation of the head (sternocleidomastoid) may themselves in the course of time be educated by training to coördinate the impulses, which have been side-tracked into the motor area of the facial nerve, so as ultimately to lead to expressional movement.

2. That the cortical centres originally presiding over movements of the face continue to play a part in the coördinate action of these muscles, possibly influencing the higher neurones of the N. accessorius through the intermediation of connecting tracts in the cortex.

HISTORICAL AND BIBLIOGRAPHICAL NOTES.

- I. The first operation, that by FAURE, was performed January 28, 1898, on a patient eighteen months after an injury causing paralysis of the facial nerve. The first communication on the subject was presented by Faure before the Académie de Médecine, Séance du 1er Mars, 1898.

- II. The procedure was made public six weeks after the operation under the combined names of FAURE and FORET in the *Gazette des Hôpitaux*, 71^e année, 8 Mars, 1898, p. 259, under the title "Traitement chirurgical de la paralysie faciale consécutive à un traumatisme intra-rocheux." L'anastomose du facial et de la branche trapézienne du spinal. Ref. in the *Centralblatt für Chirurgie*, 1898, No. 47. This paper is largely an argument for the feasibility of the operation.

III. FORET, individually (fifteen weeks after the operation), read a paper based on the same case before the Otological and Laryngological Society of Paris. *Compte rendu officiel de la Société française d'Otologie et de Laryngologie*, Séance du 5 Mai, 1898.

IV. A later mention of the case appears in FAURE'S communication nine months after the operation before the Congrès française de Chirurgie, XII^e Session, Paris, Octobre, 1898. (See *Révue de Chirurgie*, T. 18, p. 1098, 1898. "Traitement chirurgical de la paralysie faciale par anastomose spinofaciale.") The case was then reported to be stationary, and its failure attributed to the long duration of the lesion before operation. Faure gives the credit of the suggestion to his colleague Foret.

V. BARRAGO-CIARELLA seemingly demonstrated on experimental grounds that, in case of immediate anastomosis after division of the facial, return of function would follow in a few months, whether spinal accessory or vagus was utilized for the central attachment. Three experiments not conclusively worked out. His results were published in *Il Policlinico* (Sezione Chirurgica, Vol. viii-C. (fasc. 3), Febbraio, 1901, p. 124), under the title "La sutura dell' accessorio di Willis col facciale, nella paralisi del facciale." Extensively reviewed by Bréavoine (see Ref. 8) and in the *Centralblatt für Chirurgie*, 1901, Band xxviii, p. 718.

VI. MANASSE, independently, but soon after Faure's publication in 1898, performed five experiments on dogs. His results were published in 1900 in the *Archiv für klinische Chirurgie*, Band lxii, S. 805, 1900. Ueber vereinigung des N. facialis mit dem N. accessorius durch die Nervenpropfung (Grefte nerveuse). Three of these experiments were perfectly conclusive, subsequent histological examination showing continuity of regenerated nerve fibrils across the point of suture.

VII. As an introduction to the excellent thesis of his pupil Bréavoine, M. FAURE made a final report of his case before the Congrès de Chirurgie, Paris, 21-26 Octobre, 1901. It was then three years and nine months after the operation. He regarded the case as a "demi-succès," not appreciable at their earlier communications, since the muscles had recovered in a measure their excitability to faradism, although there was no voluntary motion whatever.

VIII. The most important contribution on the subject of nerve anastomosis, and the only report hitherto of a successful case of the Faure-Foret procedure followed, appearing in the Philosophical Transactions of the Royal Society, Series B, Vol. cxciv, pages 127-162. The facial nerve in this case was divided for unilateral spasmodic tic, an immediate anastomosis being made with the spinal accessory. The operation was performed May 4, 1899, by ROBERT KENNEDY.

IX. The thesis by BREAVOINE, a disciple of M. Faure, presented for his doctorate July 10, 1901, has ably summed up the history of spinal accessory facial anastomosis since the time of Foret's original suggestion. "Traitement chirurgical de la paralysie faciale d'origine traumatique par l'anastomose spinofaciale," Paris, 1901.

ON THE POSSIBILITY OF OPERATIVE RELIEF OF CERTAIN FORMS OF FACIAL PARALYSIS.¹

WITH REPORT OF A CASE.

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THE fact that the greater part of the intracranial segment of the facial nerve is lodged in a bony canal makes it probable that facial palsy will be the result of injury or disease to the nerve more often in this part of its course than either centrally or peripherally; hence its frequent occurrence from fractures of the middle fossa of the skull, from neuritis following infectious diseases, from trauma other than fractures which may cause rupture of the minute blood-vessels and extravasation of absorbable blood-clot, either in the sheath of the nerve or into the bony canal, also from carious bone or inflammatory exudate about the nerve, from disease of the nerve itself, or from passive hyperæmia.

A case is recorded by Hewett (*International Encyclopædia of Surgery*, Vol. v, page 106), in which a blood-clot occurred in the common sheath between the facial and the auditory nerves following a blow on the side of the head. A similar paralysis may follow any condition that would cause hyperæmia of the numerous small blood-vessels within the aqueduct of Fallopius.

The most reliable symptoms that characterize interference with the function of the nerve within the Fallopian canal, as deep within the bone as the geniculate ganglion (this being more often the location of the disease or injury to this nerve), are complete unilateral paralysis of all muscular movements, absence of hæmiplegia, decidedly abnormal electrical reactions,

¹ Read before the Philadelphia County Medical Society, February 25, 1903.

loss of reflex associated movements, existence of paralysis in the upper and lower halves of the face, and in addition to loss of function over the area of distribution of the nerve, paralysis of the fauces, the palate, and the uvula, may also occur as a result of the decussation of the great superficial petrosal nerve which is given off at this point to join the sphenopalatine ganglion.

When paralysis is due to injury or disease involving the geniculate ganglion itself, there is, in addition, dryness of the mouth on the same side, with some loss of taste in the anterior half of the tongue, also increased sensitiveness to musical sounds; all facial movements are paralyzed.

When, however, paralysis is due to central lesion, anywhere between the nucleus in the pons and the bottom of the internal auditory meatus, paralysis is not complete, because the branches supplying the eyelids are not affected, thus permitting of winking of the lids. This fact is said by physiologists to prove the existence of crossed fibres at the point of origin of the facial nerve, and is a valuable point in differentiating central lesions from those within the bony canal. It is associated also with hemiplegia, and usually with normal electrical reactions; there is also persistence of the associated reflex movements. There is generally degeneration from paralysis of the muscles in the upper half of the face, especially the occipitofrontalis, corrugator supercillii, orbicularis palpebrarum, and dilator narium. Not infrequently the sixth or abducens nerve is involved, causing internal strabismus; the eighth also may be implicated, causing some degree of deafness.

When the lesion is situated outside of the cranium, the paralysis affects the muscles only, and is less complete than when the lesion is centrally located. In fact, paralysis is confined entirely to the area of distribution of the particular nerve fibres involved. Under all conditions, when the nerve is paralyzed, there are certain constant and well-known symptoms present, such as absence of normal wrinkles, inability to close the eyes, irregularity in the nostrils, flaccidity of the buccinator muscle, collection of food in the mouth, and dribbling of saliva.

A case with symptoms pointing towards involvement of the nerve within the aqueduct of Fallopius presented itself at the clinic of Professor Randall at the University of Pennsylvania in July, 1902, and during his absence came under my care with the following history:

B. S., about thirty-six years of age, married, four children. Thirteen years before had had an attack of pain in the right mastoid bone. There were marked tenderness and some swelling, which continued for several weeks, disappearing spontaneously without suppuration appearing either in the auditory canal or in the mastoid bone; there were intense headache, sleeplessness, and especially gnawing and boring pain at night, the last-named being especially disturbing. All the symptoms, including the pain and tenderness over mastoid, slowly disappeared.

There was no further trouble complained of from the time of the disappearance of these symptoms (in seven or eight weeks) until two years afterwards, when she had a second attack of pain and tenderness over the mastoid, with again marked meningeal symptoms. There was not at this time any swelling nor discharge of pus from either the auditory canal or the mastoid. On this occasion, pain, tenderness, and cerebral symptoms persisted for four months, and then gradually subsided, excepting the tenderness, which persisted until February 15, 1902. On the latter date a third attack occurred, characterized by severe pain with some swelling and increased tenderness over the mastoid, pain radiating over the brow, cheek, and lower jaw, associated with vertigo, intense headache, and marked meningeal symptoms. With the beginning of this attack facial palsy developed for the first time. Again the symptoms, including the palsy, began to subside after acute suffering for about ten days, the palsy nearly disappearing. This last attack was suddenly ushered in from taking cold, July, 1902, or five months after the third attack. On this occasion, the palsy, pain, tenderness, and meningeal symptoms were again pronounced. Examination of the ear on July 28, 1902, showed nothing abnormal except, possibly, slight injection of the membrana flaccida posteriorly. Percussion over the mastoid caused intense pain, especially over its upper portion; surface temperature seemed decidedly increased. There was no swelling over the mastoid, nor any discharge from the middle ear. Facial palsy was

marked, and included the entire area of distribution of the facial nerve; there were excessive postnasal granulations from which a viscid secretion constantly exuded. In the absence, therefore, of visible middle-ear disease, and with the characteristic gnawing and boring pain of bone disease, with marked tenderness on percussion over the upper mastoid region, and with the history of repeated attacks similar in character confined to the same region, I was led to regard this case as one of chronic pyogenic osteitis of the petrous portion of the temporal bone, which was responsible for the complete palsy which existed. Exploratory operation was therefore advised, August 1, 1902.

The usual postauricular incision for exposing the mastoid bone was made, the outer table of bone was removed with a gouge, and the antrum and attic exposed. A large, disorganized blood-clot was found within the antrum, filling it completely, resembling finely ground coffee. The antrum walls were entirely carious, caries extending well in and involving a part of the outer table of the petrous portion of the temporal bone; this was curetted away. The mastoid wall and the mastoid cells proper were apparently healthy. It was decided, however, to completely exenterate the entire mastoid, and, in the absence of precise knowledge as to the cause of the pain, it was decided to expose the lateral sinus for inspection, which was done and found to be free from thrombus.

In removing that portion of the carious bone through which the facial nerve passed, care was taken, of course, to avoid injury to the nerve. It was felt at the time of operation that all carious and necrotic tissue had been removed, and that aseptic toilet could be complete; the cavity was therefore filled with moist blood-clot and the incision closed with catgut, without drainage. Union was by primary intention. Paralysis entirely disappeared within twelve hours after operation, and the patient left the hospital on the fifteenth day.

This case seems to illustrate very clearly the existence of a chronic pyogenic osteitis that had been going on for years, and, in all probability, the blood-clot found was one of many that had previously formed and been absorbed. Such a process would account for the acute attacks of pain and palsy from which the patient had previously suffered during these years.

In other words, paralysis in this instance was due to a slow inflammatory compression from exudate about the nerve, rather than to disease of the nerve itself. This it seems to me would explain the clearing up of the paralysis in the previous attacks. The pathological findings would lead one to believe that without operation it could not have cleared up again, as the compression of the nerve from the carious bony wall could not have been in any other way removed.

It is obviously important, in cases of this character, to remove the cause of compression, which is generally a slow compression rather than an acute one, before permanent nutritive changes take place. Of course, if the operation is delayed until hyperplasia of the connective tissue and interstitial neuritis take place, perfect recovery cannot occur, even though the cause be removed.

I have recently learned that this patient complains of some pain, which is probably due to an interstitial neuritis; there was not, however, any recurrence of the paralysis more than four months after the operation.

INTRACRANIAL NEURECTOMY.

REPORT OF A CASE FOLLOWED BY EXTENSIVE TEMPORARY PARALYSIS.

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THE increasing tendency, on the part of both patient and surgeon, to seek surgical interference in cases of trifacial neuralgia is a sure indication of the improved technique and decreasing mortality from the operation. In no class of cases is one more anxious and ready to employ elective surgery, when once one has either seen or, worse still, experienced the frightful suffering of a paroxysm of tic douloureux.

In the interesting series of cases operated upon by various surgeons, collected and reported by Dr. Louis Tiffany (*ANNALS OF SURGERY*, Vol. xxiv, page 575), several examples of permanent or temporary injuries produced by the operative manipulation are recorded.

The present report is for the purpose of putting on record another case of this character.

J. M., male, aged fifty-four years, a native of Vermont, presented himself to the writer, June 1, 1902, suffering from tic douloureux. Eight years previously he began to have paroxysmal attacks of pain, involving the second division of right trigeminal nerve. At first the pain was not very severe and the paroxysms were not frequent, with intervals of several weeks of complete immunity. During these eight years the disease progressed with varying speed in spite of all medical treatment.

At the time he presented himself he stated that he had been suffering almost constantly for two weeks with intense paroxysm of pain lasting about twenty seconds, with four-minute intervals. Occasionally during the two weeks the pain ceased for a few hours at a time.

During this attack the pain was most severe in the second

division of the fifth nerve, with less marked twinges in the third division. His family and personal history are otherwise negative.

Examination shows a large, robust, well-nourished man of good intellect. The skull was markedly scaphocephalic; avulsion of the right Gasserian ganglion was determined upon, and the patient prepared for operation.

Operation, June 2, 1902. Ether narcosis. The skull opened by a horseshoe-shaped osteoplastic flap, the base extending to the zygoma. The middle meningeal artery emerged from a bony canal just below the line of fracture of the flap and was there ligated and severed. The dura mater was carefully stripped from the bone with the finger. The middle fossa was found to be very deep, and, in order to expose the exits of the second and third divisions of the fifth nerve, the brain had to be crowded more towards the median line than is usual. The foramina ovale and rotundum were finally clearly exposed and the nerves emerging through them identified. Both nerves were divided. An attempt was then made to follow proximally the stump of the third division up to the ganglion, but the hæmorrhage becoming very troublesome, the operator contented himself with grasping firmly with forceps the stump of the third and second divisions and tearing away as much of the ganglion tissue as could be accomplished in one effort. A piece of sterile, flat, gutta-percha tissue was laid over the foramina ovale and rotundum and the brain allowed to fall into place. The bone flap was replaced and sutured completely, save for a narrow gutta-percha drain extending to the bottom of the skull.

The recovery from anæsthesia was uneventful.

For the first two or three days after operation patient was very drowsy and lethargic, but answered questions rationally when sufficiently aroused.

At the first dressing (on second day) there was noted a complete paralysis of right upper eyelid, also of all the muscles of the eye supplied by third, fourth, and sixth cranial nerves. Pupil markedly contracted. Vision, however, appeared normal. There was partial paralysis of left upper extremity, most marked about the fingers.

During the subsequent week the wound healed perfectly, the drain having been removed on the second day. The paralysis persisted and the mental condition only slightly improved. On

the tenth day the patient was allowed out of bed, and it was then noted that motion of left leg was also slightly impaired. At the end of two weeks the drowsiness and lethargy had sufficiently improved to admit of the patient's return to his home in the central part of the State. Otherwise, his condition was unchanged.

In October, four months after the operation, Mr. M. again visited the writer, having reported frequently by letter in the interval.

He stated that five weeks after the operation he began to be able to lift the right eyelid a little. The improvement continued until all the paralysis disappeared; this, he thinks, was about ten weeks after the operation.

At the time of his visit in October, he stated that he was perfectly well and free from all pain, but did not feel as strong as before the operation; also that his memory was very defective, a condition not existing before the operation.

On examination, no evidence of paralysis could be found, save a contracted pupil on the right side. Anæsthesia over course of second and third divisions of right trifacial nerve. He was told to continue the tonic treatment advised and to report again. In January a letter from him states that he is as well as ever, but not quite up to his full strength.

Pressure by the retractor in making a suitable exposure of the very deep middle fossa was undoubtedly the cause of the paralysis. In this case, in order to do the operation safely, the trauma could not be avoided.

The method advocated by Abbe (*ANNALS OF SURGERY*, Vol. xxxvii, page 7) for exposing the foramina doubtless precludes the risk of much pressure on the brain, but the point of entrance would be a difficult one in the case of a scaphocephalic skull with its dependent middle fossa. In such a case the writer would prefer the Hartley incision as offering a straighter though longer route to the objective field.

While the resulting paralyses were much to be regretted, and to be avoided, if possible, nevertheless, if the operator is perfectly confident that he had not divided any structures save those intended, the case reported shows that he should have every confidence in an ultimate recovery.

THE SURGERY OF THE LOWER URETER.¹

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ANATOMY OF THE PELVIC URETER.

THE pelvic portion of the ureter is naturally divided into two portions,—the parietal or fixed and the visceral or mobile. The parietal portion begins just after the ureter has crossed the iliac vessels, from which point it winds over the brim of the pelvis and passes downward and outward in close contact with the lateral wall, to a point about three centimetres in front of the spine of the ischium. At this point it makes a sharp bend inward and begins the second part of its course (the visceral) across the floor of the pelvis, on the upper surface of the levator ani muscle, to reach the base of the bladder. In the first part of its course in the left side the ureter lies in front and to the side of the internal iliac artery; on the right side it lies directly in front of it, and almost exactly parallel with it. On the left side the rectum lies in relation to the ureter in the first part of the pelvic course; but as the ureter passes outward it is separated from it by the parietal peritoneum which covers it, and it is only in relation to the rectum when it is overdistended. On the right side the ureter is never in relation with the rectum, being considerably distant from it. The ureter is crossed by the two branches of the hypogastric, the obturator and the umbilical, both of which pass in front of it.

In the second part of its course it is separated from the rectum by the levator ani muscles, and lower down, just before its entrance into the bladder, by the top of the seminal vesicle. The ureter is here crossed at right angles in front by the vas deferens, which winds around it from the lateral wall of the

¹ Read at the meeting of the Southern Surgical and Gynæcological Association, Cincinnati, November 12, 1902.

bladder, on its way to the upper end of the prostate. The peritoneum covers the ureter down to a point about two centimetres from the junction of the bladder, when it is reflected upward to cover the posterior surface of this viscus. For this space of two centimetres the ureter is loosely held to the bladder by connective tissue, and one may cut through the bladder into the ureter without getting into the peritoneal cavity.

To the outer side of the ureter the peritoneum dips downward around the upper end of the seminal vesicle, the upper end of which is thus separated from the rectum by two layers of the peritoneum (as the seminal vesicles lie beneath the ends of the ureter, the danger of opening the peritoneal cavity when attempting to reach the ureter from the peritoneum is manifest).

The course of the ureters through the bladder-wall is obliquely downward, inward, and forward for a distance of about eighteen millimetres, when they terminate in oval or slit-like orifices, enclosed on each side by folds of vesical mucous membrane which act as valves.

According to Delbet,¹ the trigone should be considered as constituted by an expansion of the muscular fibres of the ureters. Having arrived at the level of the bladder, the longitudinal fibres pass through the vesical wall, some incorporating themselves with the internal or plexiform layer of bladder muscle. The others, much more numerous, pass through and spread out like a fan in front of the vesical wall proper to form the trigone as shown in Fig. 1.

The posterior fibres proceed transversely inward and become continuous with the fibres from the ureter opposite, thus forming the interureteral muscle (Mercier's bar). The fibres which constitute this muscle are fine and compact; they pass in front of the fibres proper of the bladder, from which they are separated by a layer of fibrous tissue. The anterior fibres pass obliquely forward and inward, and, describing concentric curves, assist in forming the sphincter of the bladder. Some superficial fibres run in a direction nearly anteroposterior, and gliding under the mucosa of the vesical neck are continuous

with the internal longitudinal layer of the urethra. The trigone as thus formed is a very strong fixed body, and the ureteral orifices are firmly held together and maintained in their oblique course. Even with considerable over-distention of the bladder the interureteral distance is little disturbed. According to Glantenay,³ the ureter preserves its own muscular coats, which are separated by a layer of connective tissue from the surrounding bladder muscle.

The caliber of the intramural ureter here is much narrower than above the bladder, but not as narrow as at its orifice. No definite ureteral sphincter has ever been demonstrated, but the trigonal muscle fibres which surround it evidently serve such purpose, as it is impossible to cause a reflux of the fluid from the bladder into the ureter, by even the greatest intravesical distention, as was demonstrated by the writer in 1898.⁴ (See therein a discussion of the ureteral reflux and reversed peristalsis.)

The mechanism of intermittent evacuation of urine from the ureters varies in different subjects. As seen through the cystoscope, it is generally as follows: The orifice is first opened and drawn back and outward. The urine then begins to flow in a swift stream. The muscle of the trigone then contracts, and the orifice is then drawn forcibly downward and closed as the last urine escapes. At times the muscle action is very slight, and the outflow of the urine, being less vigorous, is more difficult to detect.

In the female the first or parietal portion of the pelvic ureter is similar in its course and relations to that portion in the male. The second part runs forward and inward beneath the broad ligament at a distance of about two centimetres from the side of the uterus. Lower down rapidly approaches the lateral wall of the vagina, and passes obliquely in front; it lies in the last one centimetre of its course (above the bladder), in direct contact with the anterior wall of the vagina. During its intramural course the posterior wall of the bladder is closely adherent to the anterior vaginal wall. The uterine artery and veins accompany the ureter in its course, being closely adherent

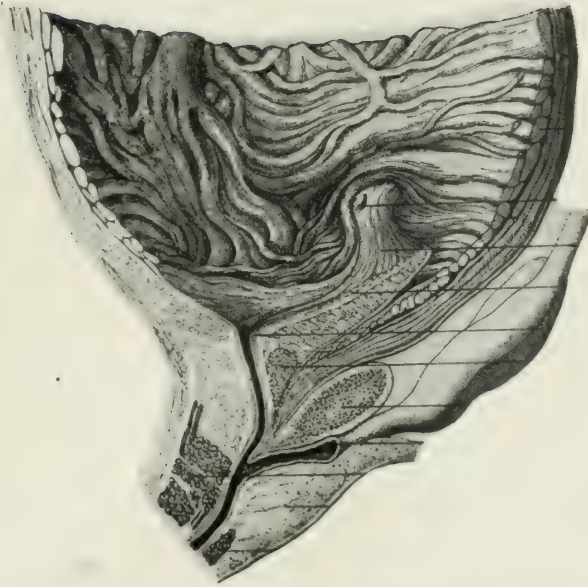


FIG. 1.—Showing the relation of the musculature of the trigone to that of the ureter and bladder.

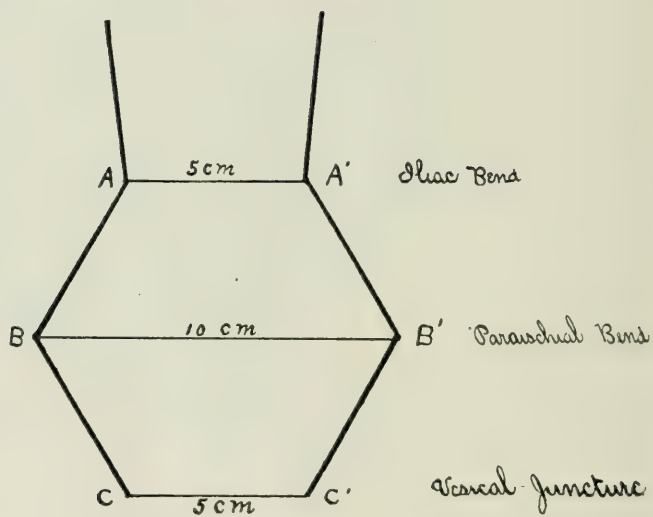


FIG. 2.—The ureteral hexagon.

to it, but, as the ureter passes out of the anterior surface of the broad ligament, the vessels turn inward in front of it.

The writer has previously proposed²¹ that the different portions of the pelvic ureter be designated according to its relations, as follows:

The iliac portion, where it crosses the iliac vessels.

The parasacral, where it lies in front of the sacrum.

The paraischial, where it is adjacent to the ischium.

The juxtavesical, that segment just above the bladder.

The intramural, within the muscosa of the bladder.

The intravesical, just above its orifice and covered by vesical mucosa.

The measurements of the pelvic portion of the ureter vary considerably in different subjects, being largely dependent upon the size and shape of the pelvis and the condition of the muscular lining and floor.

It is an interesting fact, which I called attention to in another paper,²² that the pelvic course of the two ureters may be represented with fair accuracy by a hexagon, the sides of which are each about five centimetres in length, as shown in the accompanying diagram.

Measurements of the distance between the two ureters show that they are about five centimetres apart at the brim of the pelvis (from five to seven) when they cross the iliac arteries, and also about five centimetres apart when they enter the posterior wall of the bladder. At the paraischial bend they are about ten centimetres apart (ten to twelve), or double the distance above and below. Measurements also reveal that the distance from the bend at the pelvic brim to the paraischial bend is about five centimetres, and that the distance from this point to the entrance into the posterior wall of the bladder is also five centimetres. The course of the ureters within the pelvis, therefore, form quite a perfect hexagon, each limb (radius) of which is five centimetres, as shown in the diagram; thus, A and A' represent the bend of the pelvic brim, and are, of course, five centimetres apart. B and B' represent the paraischial bends, and are ten centimetres apart (double radius). C and C', the points of the junction with the bladder, are also five centimetres distant. A B and A' B', B C and B' C' are like-

wise five centimetres. We see that such a hexagon corresponds quite accurately with the average anatomic distance of the ureters, and gives at once an easy and fairly accurate idea of their intrapelvic course. In the female, a hexagon with the sides six centimetres long is more accurate than five centimetres, the distance being this much greater than in the male.

Turning to the conditions of the ureter requiring surgical interference, we find in the literature the following :

Anomalies. Prolapse. Ureteritis. Calculus. Fistula. Tumors. Valve formation, and stricture.

URETERAL ANOMALIES.

1. As to number: The most common is that of double ureter on both sides. The ducts generally enter the bladder side by side, and both orifices may be seen with the cystoscope. Sometimes the two ureters join at some point between the bladder and the kidney, and present only one orifice in the bladder.

Cases of double ureter on each side have been recorded, and Morris asserts that the second ureter has proved valuable, its mate being blocked by calculus. Brewer had a similar case, one ureter and half-kidney being tuberculous, the other healthy. The writer had a case in which the left ureter was catheterized and clear urine obtained, but it was found at autopsy that the catheter had entered the lower branch of a bifid ureter, which led to a healthy lower half-kidney. The upper half was filled by a very large calculus which blocked its ureter completely.

2. As to location of the termination: The following classification is given by Delbet.¹ (a) In the bladder. The course of the ureter through the bladder-wall may be much too long or the lumen may be congenitally strictured. Schartz reported a case in which the lower end of the ureter was closed, and the dilated portion above was separated from the bladder by a double layer of mucous membrane. (b) In the rectum. Termination in the rectum has occurred, but always in monstrosities. (c) In the prostate. In the male the ureter has been found to open in the veru montanum, and in other parts of the

prostatic urethra. It has also been found to open into the ejaculatory ducts, the seminal vesicles, and the vas deferentia. (*d*) In the female; into the vagina, the uterus, the prepuce of the clitoris, and the urethra.

According to Morris,² these anomalies are directly dependent on errors of development, and are usually associated with other congenital deformities. Those in the lower part of the vagina or rectum are seldom found except in monsters. As the abnormal orifice is always narrowed, dilatation of the ureter above is generally present. When the termination in the bladder is blind, there is generally a thin-walled intravesical tumor in the region of the ureter (prolapse).

Fenger,⁵ in a very thorough discussion of the subject, outlines the treatment as follows: The abnormal termination of open ureters in the urogenital apparatus in man will probably never be diagnosed, and consequently will not be an object for treatment. On the other hand, the abnormal termination of the ureter in the vulva, vagina, or urethra in woman has already often demanded surgical interference, with the object of curing the incontinence. The operation has for its object the direction of the abnormal ureter into the bladder as near as possible to the normal place, and the exclusion of the distal end of the ureter from the passage of urine.

The following methods have been proposed:

(1) Epicystotomy: implantation of the ureter in the posterior wall of the bladder and obliteration of the peripheral end.

(2) Excision of the distal end of the abnormal ureter; vaginal implantation of the proximal end into the bladder.

(3) Extraperitoneal isolation of the abnormal ureter and the bladder through a convex subpubic incision, and resection of the lower border of the symphysis. Through this wound the ureter is isolated and its central end implanted into the bladder. Colzi reports one successful case.

(4) Ureterocystotomy: a communication made between the bladder and the dilated portion of the abnormal ureter. Wölfler effected this with apparent success by means of a special instrument analogous to Dupuytren's enterotome.

" Criticism of the Methods. Epicystotomy and implantation of the ureter in the posterior wall of the bladder, although successfully performed by Tuffier and Baumm, is a more grave operation than the vaginal implantation. The same may be said of the extraperitoneal implantation with partial resection of the symphysis, as successfully performed by Colzi. To make a direct communication opening between the dilated ureter and the bladder, as done by Wölfler and Bois, is technically difficult. Thus the operation from the vagina is probably the safest method, and should be first attempted. If not successful, one of the other methods might be resorted to."

PROLAPSE OF THE URETER INTO THE BLADDER.

This is a rare anomaly, judging from the fact that only about seventeen cases have been recorded. The prolapse may be congenital or acquired. Of the fourteen cases collected by Blumer⁶ ten were evidently of congenital origin, and in five cases led to death early in life. The deformity in these congenital cases consists for the most part in a partial or complete closure of the lower ureteral orifice. The terminal prolapsed portion of the ureter may alone be dilated, the ureter above being normal. On the other hand, there may be a uniform dilatation of the entire ureter.

Of still another variety is a case previously reported by the writer⁷ in which there was present ballooning of the ureter while it was functioning, but which would disappear as soon as the outflow of the urine ceased (see full history, Case I in appendix).

The etiology of all these cases is probably to be ascribed to the stricture at the orifice of the ureter. Dickinson ascribes the subsequent prolapse to the downward pressure exerted by the swollen and rigid cylinders (ureters). But dilated ureters are common at the autopsy table, being present in numerous cases of prostatic hypertrophy, but we never see a case of prolapse among them.

Burckhart held that the abnormality arose from the congenital lack of musculature of the bladder-wall. Boström held

that it was due to the ureter passing not obliquely but straight through the bladder-wall.

I think my case showed that neither was correct, but that the dilatation occurs first in the intravesical portion of the ureter, above the stricture, at the extreme orifice of the ureter (first a collapsing balloon). Later the dilatation proceeds upward, destroys the sphincteric character of the surrounding muscle, and the balloon becomes permanently filled, the so-called prolapse, with ultimately dilatation of the entire ureter and renal pelvis above.

The following interesting case was reported by Caillé.⁸ A female child two weeks old presented a rounded tumor, the size of a walnut, protruding from the urethra. After careful examination, it was found that the tumor was a prolapse of the right ureter, which was greatly dilated externally, but connected with the interior of the bladder by a narrow pedicle. This was ligated and divided. The child died and autopsy showed marked dilatation of both ureters.

URETERITIS.

This may be simple or tuberculous, and is not different in the lower ureter than in the upper, except that it is much more apt to lead to stenosis at the lower end. It is principally on account of its diagnostic value that I wish to discuss it here.

The ureteral orifice is very apt to appear congested, when the kidney above is the seat of disease even slight in character. When the kidney is the seat of inflammation, the changes in the ureteral orifice often become very marked; the most common being, hyperæmia, swelling or eversion of the surrounding mucosa, and contracture of the orifice, which may be changed from a slit to a small round hole, situated at times in the top of the cone-like projection.

The following cases show the diagnostic value of the cystoscopic inspection of the ureteral orifices.

CASE I.—The patient, a man, had had symptoms suggesting ureteral calculus of the left side for three years. The radiograph

showed no calculus, and the urine contained so little pus that its source could not be detected by the plain cystoscope. Inspection of the ureteral orifices showed the right to be normal in every way and emitting jets of clear urine. The left ureteral orifice, on the other hand, was distinctly abnormal, the ridge much enlarged, and at the proper location for the orifice. There were numerous small polypoid projections of mucous membrane which floated in the vesical fluid. It was impossible to make out the orifice or the urine coming from it. The bladder was normal. Extraperitoneal operation was performed; the ureter was found markedly enlarged and thickened throughout its entire length, and examination of the kidney showed it to be tuberculous. Nephro-ureterectomy was performed.

In this case the left ureter could be catheterized, and the appearance of the ureteral orifice alone indicated the diseased side. The urine obtained by catheter from the right side was normal. (See complete history, Case II in appendix.)

CASE II.—In another case, a male, with indefinite symptoms referable to the left kidney, but in which the urine was normal, the cystoscope showed an extensive bulging of the bladder-wall about a much contracted ureteral orifice. The ureter catheter met with an impassable obstruction just above the orifice. When the ureter was exposed by the extraperitoneal operation, a stone about the size of an almond was found impacted in it just above the bladder. (Case V in appendix.)

In two other cases, however, in which small stones were impacted in the right ureter within four centimetres of its end, the orifice showed no abnormality, but the ureteral catheter and X-ray made it clear that a calculus was present not far from the orifice. (Case VI in appendix.)

In non-infected renal pyuria the orifice of the ureter may be normal in appearance, though it generally shows some congestion, and often eversion of its mucous membrane. The prolapsed papillary condition of the orifice, as seen in the first case above, should, in the absence of a detection of a calculus with the ureter catheter or X-ray, always suggest tuberculosis, as should also an enlarged thickened ureter at operation.

Atrophy of one side of the trigone and contracture of the

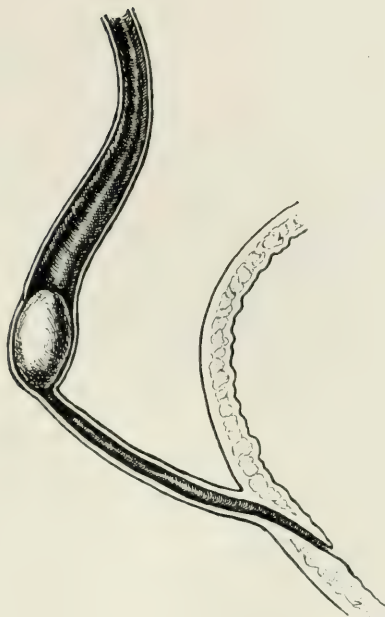


FIG. 3.—Calculus impacted in paraischial portion.

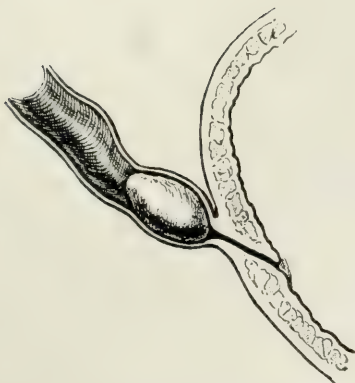


FIG. 4.—Calculus in juxtavesical portion.

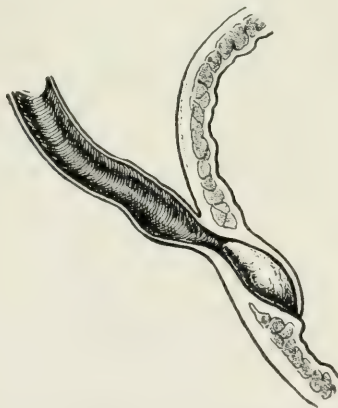


FIG. 5.—Calculus in intramural portion.

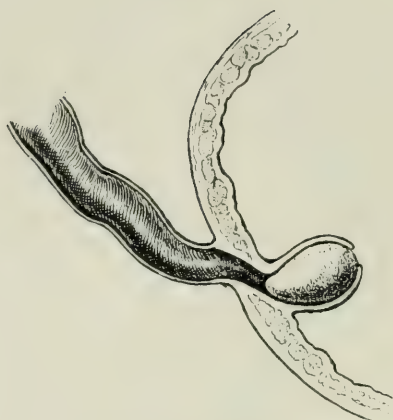


FIG. 6.—Intravesical ureteral calculus.

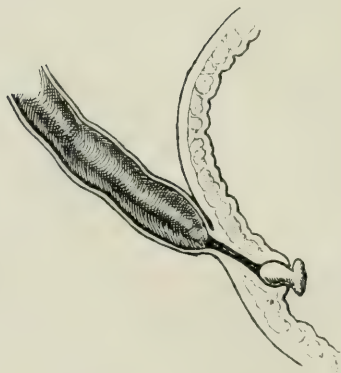


FIG. 7.—Intravesical ureteral calculus.

ureteral orifice may be of great diagnostic value, as shown by the following case.

A young man, aged twenty-one years, came to me complaining of a chronic sinus in his left lumbar region, supposed to be due to necrosis of the twelfth rib. His history did not suggest renal disease, and the urine was clear; but in order to make my examination complete, I performed a cystoscopy, and found the left half of the trigone flat, the muscles atrophic, the usual ridge absent, the ureteral orifice of pinpoint size, and no urine flowing from it. The diagnosis of obstruction of long standing was at once made; an X-ray was taken, and showed calculi in the left kidney. The operation demonstrated that the ureter was completely blocked by a pelvic stone, the kidney having been reduced to a fibrous sac. (See appendix, Case III.)

CALCULUS IN THE LOWER URETER.

The ureter has four points of congenital narrowing, viz., below the renal pelvis; where it crosses the brim of the pelvis; at its vesical junction; and its orifice in the bladder.

A calculus which passes the first two may become lodged in either of the last two. Calculi are found elsewhere in the pelvic ureter, especially in its paraischial portion, probably owing to the rather sharp bend made by the ureter at that place. These points of predilection are graphically shown in the accompanying charts, viz., the paraischial, the juxtavesical, the intramural, and the intravesical (Figs. 3, 4, 5, 6, and 7).

In the female, that portion of the ureter lying within the broad ligaments is frequently narrowed by diseases of the female pelvic organs, and furnishes quite a common point for the impaction of calculi.

In the male, calculus of the lower ureter is apparently rare; and in a recent study of the literature I was able to collect only eighteen operated cases, including two of my own.²¹ I can now add another case which I have recently operated upon, thus making nineteen cases.

The location of the impaction was as follows: juxtavesical, 8; intravesical, 5; paraischial, 1; intramural, 3;

juxtavesical and paraischial, 1 (three stones); juxtavesical to iliac, 1 (seventeen centimetres long).

Various routes have been employed for the extraction of these calculi, and the results obtained were as follows:

I. Intravesical, 9; result not noted, 3; recovered, 6.

II. Perineal (prerectal), 1; recovered.

III. Intrarectal, 1; died.

IV. Iliac (extraperitoneal), 8; recovered, 6; died, 2.
Total, 19 cases; result not noted, 3; recovered, 13; died, 3.

I.—The intravesical route has been used in the male in three ways: (*a*) through a perineal urethrotomy; (*b*) through a suprapubic cystotomy; (*c*) through the urethra by means of a male catheter cystoscope, and by a lithotrite.

The suprapubic method has been employed in six cases with success in each. In all of these cases the stone was impacted in either the intravesical or intramural part of the ureter. In two, the operator thought he was dealing with a pedunculated intravesical tumor.

Harrison detected with the cystoscope a calculus protruding from the ureter and removed it with the lithotrite. Cystoscopic extraction has been employed once in the female, by Hall, of Cincinnati,¹² who dislodged the stone by means of a probe through a Kelly speculum, and once in the male by the writer.

In my case, the stone, which had given rise to symptoms both renal and vesical for three months, was found protruding from the orifice of the left ureter and dislodged by means of the male ureter catheterizing cystoscope of Casper. The manoeuvre is shown sufficiently in the accompanying drawing (Fig. 8). (See appendix, Case IV.)

In the female, intravesical and intramural impactions may be reached through the urethra, or through the vesicovaginal septum. Kelly⁹ reports a case of intramural calculus removed by urethrotomy through this route, the patient being in the knee-chest position and the bladder distended with air.

II.—The perineal prerectal route has only been employed by Fenwick,¹⁰ who made a transverse incision in the perineum,

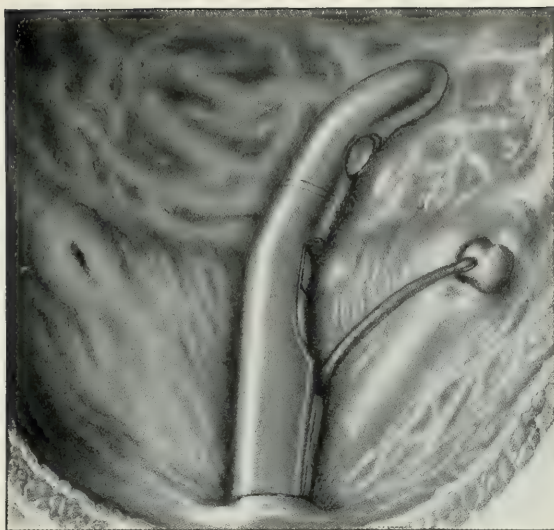


FIG. 8.—Cystoscopic extraction of intravesical ureteral calculus.

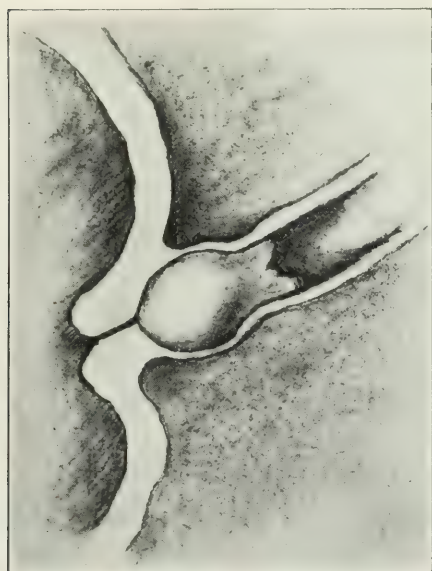


FIG. 9.—Diagram showing the stricture of the intramural ureter with the calculus impacted just above it.



FIG. 10.—The calculus used as a bobbin to place the sutures, after having been pushed up to a point in the ureter above the pelvic brim.

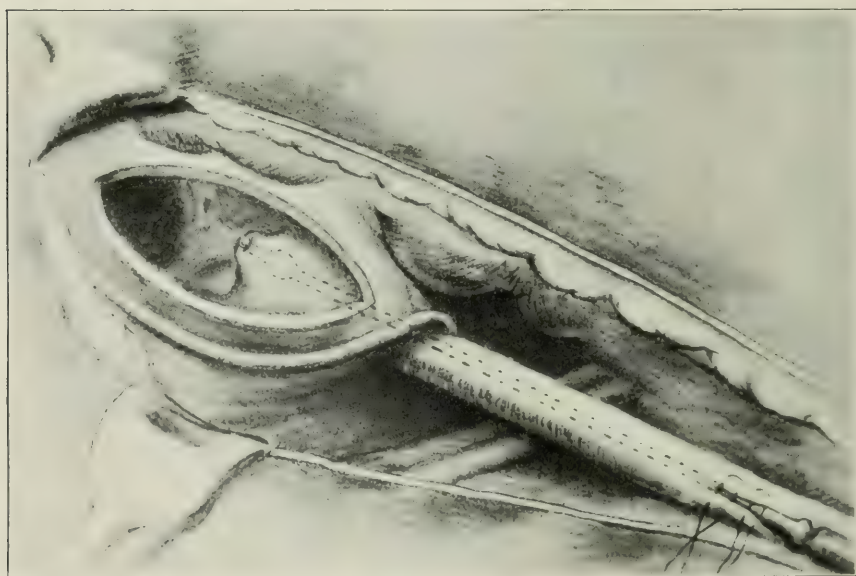


FIG. 11.—Showing the lateral incision into the bladder, the vas deferens, the dilator in the ureter, with its point protruding into the bladder through the stricture.

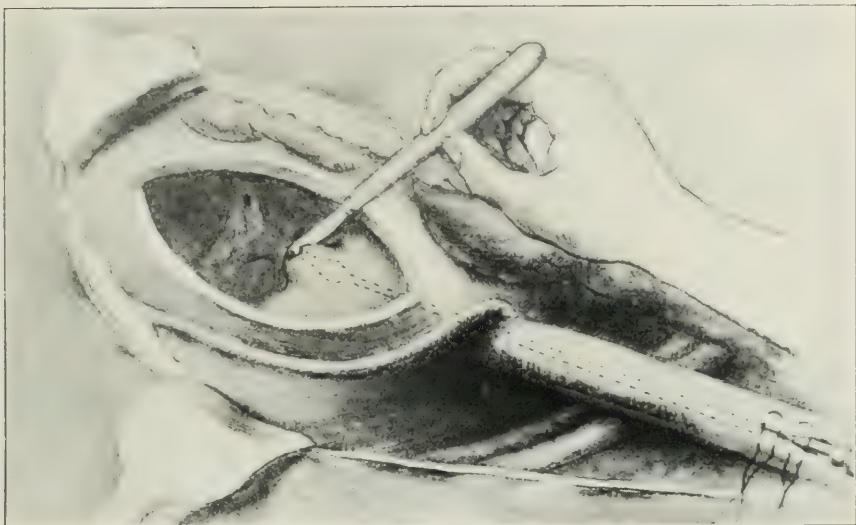


FIG. 12.—Showing the intravesical division of the stricture upon the ureteral dilator.



FIG. 13.—Another diagram showing the division of the stricture upon the ureteral dilator.

separated the rectum from the prostate, and thus exposed the ureter with a calculus impacted in the juxtavesical portion. The stone was removed through a longitudinal incision. The ureter was drained, and the patient recovered.

Fenwick thinks this the method of choice where the calculus is low down in the ureter, but Regnier¹¹ tried to reach the ureter in this way, but was unable to do so, and had to employ the iliac route.

III.—The intrarectal route has been employed but once, and that with fatal result. It has nothing to commend it.

IV.—The iliac (extraperitoneal) route has been used for the lower end of the ureter in the male nine times by five operators: Twynam, Morris, Israel, Finney, and the writer. These cases have been more severe, as a rule, than those operated on by other methods, and in three cases complete nephro-ureterectomy was done. There were, however, only two deaths.

My first case was that of a man, twenty-nine years of age, who had had symptoms of ureteral calculus for twenty-seven years. The cystoscope showed a bulging of the bladder-wall above the left ureteral orifice, and the ureter catheter met with an obstruction one centimetre above. In the radiograph, the shadow of the calculus, the size of an almond, appeared in the left half of the pelvic space. The calculus was removed extraperitoneally by the iliac route and the ureter sutured. A stricture was found at the intravesical end of the ureter, and, as it could be dilated above, was divided intravesically through the wound in the lateral wall of the bladder (Figs. 9, 10, 11, 12, 13). (See appendix, Case V.)

The second case was a man, aged twenty-five years, who had had symptoms of calculus of the right ureter for five years. The urine was normal, and the cystoscope showed a healthy bladder; but the ureter catheter met with an obstruction about four centimetres above the vesical orifice, and the X-ray demonstrated a small calculus in the right half of the pelvic space. The calculus was removed as in the first case. It was found tightly incarcerated in the ureter about one and one-half centimetres above the bladder. Stricture of moderate degree was present below the calculus and was dilated by bougies. The patient made a

good recovery, and there was no leakage. (See appendix, Case VI.)

These two cases serve to demonstrate the efficacy and simplicity of the extraperitoneal iliac operation. As late as 1898 Fenger⁵ asserted that this portion of the male ureter was beyond the reach of the surgeon.

In the female, according to Schenck,¹² ureteral calculi have been extracted through the urethra about eight times with one death, and through the vagina thirteen times with one death. Morris² twice removed a calculus from the pelvic ureter in the female through a parallel incision. The incision was made parallel with the sacral spines; the edge of the gluteus maximus and the sacrosciatic ligament were divided, the ureter incised, and the stone extracted. Morris prefers this route to the iliac route in both male and female. The extraperitoneal or abdominal route has been employed several times in the female, but never in the male for this portion of the ureter. This route is quite generally condemned.

The iliac route has seldom been used in the female for extraction of calculi; Israel being a notable exception.

The Choice of Route for Stone in the Lower Ureter.

As outlined above, surgeons are far from agreed on this question. When the stone is intravesical or intramural, all are agreed that it should be removed through the bladder. The simplest means are with the cystoscope, as in the two cases detailed above. If projecting well into the bladder, the lithotrite may suffice to extract it as in Harrison's case. In the female, after dilating the urethra, forceps may be introduced and the calculus withdrawn.

If none of these suffice, or the stone is intramural (and therefore out of the reach of such methods), suprapubic cystotomy in the male, and vaginal cystotomy in the female, after the method of Kelly,⁹ should be done. When the stone lies in the juxtavesical ureter,—in the last two or three centimetres which are in close apposition to the vagina,—it can be

easily removed by the vaginal operation. The only objection to the method is the danger of a ureteral fistula persisting, and the inability to inspect and explore the upper ureter and kidney. When the calculus is higher up in the female ureter, various objections to the vaginal operation present themselves, which will be discussed later on.

Calculus in the deep pelvic ureter in the male has received much attention, but there is still little unanimity of opinion in the literature as to the proper method of attacking it.

Cabot,¹³ in 1892, deeming the iliac extraperitoneal operation inadequate for calculi of this portion of the male, suggested that the ureter might be reached through a Kraske sacral-flap operation.

Le Dentu held this portion of the ureter to be inaccessible in the male, and in 1898 Fenger endorsed this view.

Writing in 1898, Fenwick¹⁰ said that a calculus below the pelvic brim should be removed by the perineal-prerectal route, which he had employed in one case.

In 1901, Morris² said, "when a stone is impacted in the ureter near its lower end, but too far off to be removed through the bladder or the vagina, the sacral route should be employed." In the male he advised the prerectal or perineal route of Fenwick.

Schenck,¹² in 1901, said, "when located within two inches of the bladder, the choice is between the vaginal ureterotomy, rectal ureterotomy, vesical ureterotomy, or perineal ureterotomy."

Thus we see that up to the last year only two published cases of the iliac extraperitoneal operation for stone in the lower pelvic ureter in the male were recorded,—one in a child, the other in an adult, and with fatal result.

The view was generally held that this portion of the ureter could not be reached by the extraperitoneal iliac route, and the French were advising nephrostomy rather than an attempt at removal of the calculus.

Late in 1901 Israel's book¹⁴ appeared. In it were published three cases of calculi removed from the deep pelvic ureter

in the male by the extraperitoneal iliac incision, and four cases in women in which the same route was employed for stones which could be felt per vaginam. In these seven cases Israel had two deaths, one male and one female, both due to heart failure. His cases disproved at once the prevailing opinion that the pelvic ureter was beyond the reach of the extraperitoneal iliac operation.

Before Israel's book appeared in America, Finney and the writer had each successfully removed calculi, which were impacted in the deep pelvic male ureter, by the iliac extraperitoneal route. These cases were reported by the writer in the *Transactions of the Philadelphia County Medical Society* for March 12, 1902.²¹ Since then I have had an additional case.

In each of my cases, although the calculus was incarcerated in the ureter at its vesical juncture, it was readily exposed, dislodged, pushed upward in the ureter to a point above the pelvic brim, and there removed through a small incision, which was easily sutured (Fig. 10).

It has therefore been demonstrated by six cases published within the last year that the deep pelvic portion of the male ureter is just as accessible by the extraperitoneal operation at the upper ureter, and that calculus of even the juxtavesical ureter can thus be removed with ease.

The only other methods which have been employed are the intrarectal, which was used by Ceci with fatal result, and the perineal-prerectal, which is manifestly only suitable for calculi immediately above the bladder, and has several great disadvantages, viz., the inability to examine the ureter and kidney above or to determine the presence of stricture below; the danger of entering the peritoneal cavity, especially when the seminal vesicle is the seat of chronic inflammation, and the inability to suture the ureter after removal of the stone. One operator (Regnier) who attempted to reach the ureter by this route failed, and had to resort to the iliac.¹¹

The iliac route, on the other hand, has many advantages, viz., the ability to explore the kidney and the ureter above and below, to dilate or incise a stricture below, as in my case, to

close the ureteral wound by sutures, or to perform nephro-ureterectomy if necessary (as in Israel's case, where the stone was seventeen centimetres long). Considering, then, that the perineal route has only been used successfully once, that at least one surgeon has failed with it, that the wound is narrow, deep, and dark, and the procedure encumbered with numerous disadvantages as outlined above, I cannot agree with Fenwick and with Morris, authorities though they be, in considering it the method of choice in the male, but feel convinced that the iliac route is the only justifiable method.

As to the method of choice in the female, I cannot speak from personal experience. I am aware that a number of cases in which gynæcologists have removed through the vagina calculi from the lower end of the ureter are to be found in the literature, but I am also aware that it has at times been impossible to reach them by this route. Morris himself says that the method is only applicable to stones of the juxtavesical portion and not for those of the paraischial or parasacral portions of the ureter. For these he advises the pararectal route, which he has twice employed in the female out of six cases of calculus of the pelvic ureter in the female.

Israel has only twice successfully employed the vaginal route. In each of these cases the stone was small and lay in the juxtavesical portion immediately adjacent to the vagina. In two other cases, in which the calculus was impacted in the paraischial portion, and therefore separated from the vagina by the intervening subligamentous tissues, all attempts to reach it failed, and he had to resort to the iliac route. In the remaining two cases Israel adopted the iliac route without attempting the vaginal.

These cases show very conclusively that calculus of the pelvic portion of the ureter in the female cannot and should not always be attacked from the vagina. Morris admits this, but advises the use of the posterior pararectal route, which involves a division of the gluteal muscles and sacrosciatic ligament, and requires great care to be taken to avoid injuring important

vessels and nerves. This method is certainly not nearly so simple nor so thorough as the iliac route.

It seems very clearly proven, then, that calculi in the pelvic portion of the ureter in both male and female can be most easily extracted by the iliac route, which is greatly to be preferred, for the many reasons set forth above, to any of the inferior routes, with the possible exception of the juxtavesical portion in the female, in which calculi are very close to the vagina. The frequent persistence of fistulæ after the vaginal incision may yet prove the iliac method to be the most satisfactory for even these cases.

FISTULA OF THE LOWER URETER.

This may be congenital or acquired. The congenital forms have already been described under the subject of anomalies.

The acquired variety is generally due to injuries during childbirth from the obstetrician's forceps, or to prolonged pressure of the foetal head. A more common cause is instrumental injuries during operations for disease of the female pelvic organs, particularly carcinoma of the cervix uteri. In nearly all cases the fistula opens into the vagina. According to Stoeckel, who has made an exhaustive study of the subject,¹⁵ spontaneous healing occurs in a very small number of cases. The operations which have been employed are as follows:

1. Plastic operations to close the vaginal fistula.
2. Colpocleisis,—closure of the vagina, and thus damming back the urine which escapes into it.
3. Implantation of the upper segment of the ureter into the bladder, the rectum, or skin.
4. Anastomosis of the ends of the ureter divided at operation.
5. Nephrectomy.

Of these methods, colpocleisis, implantation into the rectum and the skin, and nephrectomy are now very seldom employed.

Attempts to close the vaginal opening have been so often unsuccessful, that when anastomosis of the two ends of the

ureter cannot be done, extraperitoneal implantation into the vertex of the bladder seems to be the operation of choice. We have not space here to discuss the pros and cons of the various procedures, and the reader is referred to the exhaustive studies by Petersen,¹⁶ Kelly,¹⁷ Bovee, Stoeckel,¹⁵ and others.

TUMORS.

Involvement of the lower ureter by neoplastic growths occurs not infrequently in tumors of the bladder. Primary tumor of the lower end of the ureter must be extremely rare, as I can find no recorded case. When the renal pelvis and upper ureter are the seat of papillomatous growth, the lower end may also become involved, as in a case of mine in which I found a polypoid tumor projecting around the ureteral orifice into the bladder, and a large tumor of the kidney present. On the other hand, the orifice of the ureter is very commonly involved in vesical neoplasms. Israel¹⁴ says that the ureteral papilla is the place of predilection for the development of cancer of the bladder, and the contracture of the orifice, with consequent dilatation of the renal pelvis, occurs quite soon, as a rule. He reports one case in which the ureteral orifice was surrounded by a carcinomatous growth, in which he excised the tumor with a portion of the ureter, the proximal end of which he transplanted to another part of the bladder, with good result. A portion surrounding the ureteral orifice may be excised without necessitating the transplantation of the ureter, as in the following case in my practice.

A male, aged sixty-five years, had suffered with intermittent hæmaturia for four years. On cystoscopic examination I found a large globular, pedunculated tumor covering the right ureteral orifice. Suprapubic incision was made, and the tumor was found to spring from the region of the right ureteral orifice by a short pedicle, two centimetres thick. After clamping the pedicle, I cut it off below the clamp with the cautery, ligated a few bleeding points, and closed the bladder with drainage. Cystoscopic examination thirteen months later showed no return of the growth. (See appendix, Case VII.)

VALVE FORMATION.

Although Fenger was able to collect a number of cases of valve formation at the upper end of the ureter, I can find only one reported case for the lower end. This is a case which has just been reported by Morgan.¹⁸

His patient, a man aged twenty-one years, had had intermittent attacks of pain in the left loin for four years. At operation a large dilated ureter was found, and on following it downward a constriction was encountered one and one-half inches above the bladder. The obstruction was thought to be due to some local inflammatory action forming a band-like adhesion around the ureter. Above this point the ureter was dilated, forming a posterior sacculation. Within this he found a transverse fold of mucous membrane, which closed the opening of the lower ureter like a valve, thus preventing the free outflow of urine.

Three operations were performed; the operator finally finding it necessary to open the bladder twice through a suprapubic incision, and the ureter three times through the iliac extraperitoneal before he was able to cut the valvular fold and provide free exit for the urine. The vesical incision was used only to pass the catheters up the ureter, the valve being divided with scissors through the iliac wound.

Morgan offers the following explanations: "The inflammatory bands impeded but did not totally obstruct the flow of urine. This led to a gradual pouch formation, which finally became of such size as to make a sharp angular deformity at the place of most dense adhesion, and this angular deformity led to a valvular mucous fold which intermittently completely shut off the ureteral current." The kidney was thus not destroyed.

STRICTURE.

Stricture of the lower ureter has only recently attracted any attention. In a recent paper on the subject, Kelly²² states that practically nothing has been said in the literature about stricture of the lower ureter.

I have not the time here to discuss the various causes of stricture of the ureter, and will have to omit the numerous affec-

tions of the female pelvic organs which may diminish the caliber of the ureter by pressure, or by a direct infiltration of its walls, and devote myself entirely to the simple strictures of the lower end. These may be produced by scar tissue around the vesical orifice or by inflammation of the walls of the ureter itself. Stricture of the latter variety may follow the laceration produced by the passage of calculi. The irritation caused by an impacted calculus is very apt to lead to the production of stricture below it.

Kolisher, Casper, Kreissl,¹⁹ and Kelly have reported cases of stricture of the ureter which have been treated by dilatation with ureteral catheters, thus permitting the subsequent passage of small calculi.

In a careful study of the literature, I find only two cases of operation for stricture of the lower end of the ureter. I do not include that reported by Meyer,²⁰ which was really one of calculus, but will give a brief abstract of his interesting case.

A man aged twenty-three years had five years before suffered with renal colic on the left side. After that he had little trouble, except a slight pain in the bladder at the end of urination. On cystoscopic examination the left ureteral mouth appeared swollen and ragged, the left ureteral fold more prominent than normal, projecting like a small tumor into the bladder. No fluid was seen coming from it. The ureter catheter met with an obstruction about one-half inch above the orifice, but the right ureter was catheterized easily and gave normal urine. A diagnosis of stricture of the left ureter near its vesical end and renal calculus was made. At operation the kidney looked healthy. There was no stone present in the pelvis, but a ureteral stricture was found six inches below the kidney. Four days later the kidney was extirpated. The wound healed well, but the patient continued to suffer pain, and the urine was purulent. Dr. Meyer then operated a third time and removed the ureter. "When about to tie off the lower portion at its entrance into the vesical wall, a stone of about the size of a large pea was found firmly wedged in the ureter just above the ureteral mouth. It was dislodged and removed with the entire ureter." The patient made a good recovery. It was not definitely determined that a stricture was present.

The first case of simple stricture was that of Israel,¹⁴ who reports the case of a woman on whom he performed nephrolithotomy. On passing a bougie down the ureter he discovered a tight stricture just above the bladder. Nothing further was done to the stricture, and the kidney was drained. Afterwards attempts were made to dilate the stricture by catheterizing the ureter through the cystoscope, but without success, and, as the fistula still persisted eight months later, a second operation was performed, and the ureter explored extraperitoneally down to its vesical juncture. The stricture was found to begin at a point three centimetres above the bladder and to extend down to the entrance of the ureter into the vesical wall. The ureter was severed close up to the bladder, and the strictured part resected. The bladder was then opened on a sound high up on its posterior wall, the ureter cut obliquely, and its mucous membrane sutured to the mucous membrane of the bladder in one angle of the vesical incision. The rest of the bladder wound was then closed. The result was excellent. Before the renal fistula closed, Israel showed, by inserting a catheter into the ureter through the fistula and filling the bladder with fluid through the urethra, that none would flow back through the new ureteral wound unless the catheter was pushed into the bladder,—thus demonstrating that the orifice had a valve-like mechanism. Study of the specimen showed that the stricture was impermeable.

The second case was reported by the writer ²¹ in March, 1902. A man aged twenty-nine years, with symptoms of ureteral calculus since the age of two years, was found to have a large calculus impacted in the ureter at its vesical juncture (Fig. 9). This was removed by the extraperitoneal iliac route; but after its extraction, an impermeable stricture was found in the intramural course of the ureter just behind its vesical orifice (Fig. 13).

Many attempts were made to dilate this, but it was found impossible to pass even the smallest probes through its lumen. I therefore decided to divide the stricture within the bladder, which I accordingly exposed on its left lateral wall (through the original iliac incision), having to dislocate the vas deferens downward out of the way before incising the bladder (Fig. 11). After the bladder had been opened and the fluid evacuated, several attempts were made to pass a probe into the ureter from the bladder, but it was found impossible to push it farther than one

centimetre. Working with the bulbous dilator through the ureter from above, and making counterpressure in the bladder by covering the orifice of the ureter with the end of the index-finger, it was finally possible to push the small end of the dilator through the stricture until its point appeared in the bladder, as shown in Fig. 11. Around the dilator one could easily feel a hard fibrous ring about four millimetres thick. As all attempts to pass even the smallest instruments had failed, I decided to cut the stricture from within the bladder, and this was successfully accomplished by a long-handled scalpel, as seen in Fig. 12, and as fully described in the appendix, Case V. The largest ureteral dilators were then easily passed into the bladder. The lateral vesical wound was closed, and the patient made a rapid recovery, no leakage of urine occurring. The cystoscope, six months later, showed that the divided ureteral orifice had remained slit-like and pervious.

The method used in this case would possibly have been applicable to Meyer's case if a stricture was present below the calculus, and the kidney thus have been saved. In Israel's case the stricture was too high up and transplantation was the proper operation.

In another case (appendix, Case VI), after removing a calculus from its impaction one and one-half centimetres above the bladder, I found below it a stricture of the ureter, but it was easily dilatable, and the intravesical operation was not necessary.*

The cases referred to above show the necessity of sounding for stricture of the lower ureter in all cases of ureteral calculus, or when the calculi have previously passed through the ureter, for unquestionably the breaking down of sutured ureteral wounds and the persistence of urinary fistulæ are often caused by the presence of undiscovered strictures of the ureter below.

* April, 1903. I have recently operated upon a case of stricture of the ureter caused by inflammation of the right seminal vesicle which involved the juxtavesical ureter. The ureter and kidney were so badly dilated and inflamed that nephro-ureterectomy had to be done. The lower end of the ureter was found tightly bound to the upper end of the seminal vesicle, and its lumen reduced to a very small caliber by a dense stricture one centimetre long. Recovery.

It will generally be easy to dilate them with successive bougies, but when all such attempts fail, and the stricture is of the intramural portion of the ureter, the operation employed in my case may be done. The technique is simple, and the exposure obtained through the lateral cystotomy wound excellent. Its use in Morgan's case would have done away with the extra suprapubic incision (see Valve Formation and ¹⁹).

When the stricture is just above the bladder, in the juxta-vesical portion, transplantation by the method employed by Israel should prove satisfactory. Even when the stricture is situated several centimetres above the bladder, the ureter may be implanted into the vertex of the bladder if this is large enough to allow its being drawn upward some distance, and thus make up for the shortened ureter. In such cases, however, resection of the stricture with end-to-end anastomosis of the ureter, or the plastic described by Fenger (longitudinal division of the stricture, with transverse closure), might be employed; but such cases do not come within the scope of this paper, which is intended for lesions of the lower end only.

APPENDIX.

REPORT OF CASES IN FULL.

CASE I.—*Intravesical Balloon Formation at the End of the Left Ureter.*

J. W., aged forty-nine years. Complaint, burning on urination; swelling of testicles. No history of tuberculosis. Gonorrhœa thirty years ago.

Fourteen months ago, without apparent cause, blood escaped from the urethra during an interval between urinations. Has not noticed any subsequent bleeding, but since then urination has become more frequent and irritating. He now has to get up three or four times every night to void urine. He does not know when the testicular swelling began.

Examination.—A thin, rather anæmic man. Chest rather symmetrical. On auscultation the fronts are clear, except for an occasional dry crackle of pleural origin in the lower fronts. Heart

normal. Abdomen negative. No tenderness in the region of the kidneys, nor in the hypogastric region.

Genito-Urinary Examination.—The urethral meatus is reddened, but no discharge is present. There is a small hydrocele of the right side; the epididymis presents a nodular mass in the globus minor. The testes seem normal.

Rectal examination shows considerable enlargement and induration of the right lobe of the prostate. The left seminal vesicle and vas deferens are enlarged, indurated, and tender. The right is not palpable.

Urine.—Albumen very abundant. Microscopically, pus-cells and tubercle bacilli present in great numbers.

Cystoscopic examination revealed very peculiar intravesical changes. The right half of the bladder was perfectly healthy in appearance, and the ureter on that side was normal. On the left side, over an area extending from the ureteral orifice around and behind the left ureter, outward along the left lateral wall, and also a portion of the anterior wall of the bladder, the mucous membrane was markedly changed, of a general deep-red color, individual vessels not visible, and the surface rough, thrown into folds.

The cystoscopic picture was an unusual one for tuberculosis, showing itself more as thickening and congestion of the mucosa without definite ulceration.

The Left Ureter.—While hunting for the mouth of the left ureter, a very peculiar smooth, glistening, round tumor of the size of a small grape was seen, but was soon lost sight of. The left ureteral ending was then found, appearing as a fine pin-point opening, lying in a wrinkled mass of mucous membrane. While watching for the urine to spurt from the orifice, the small, round tumor suddenly appeared, and then as rapidly disappeared.

On further study it was found to rise up like a balloon at intervals of about twenty seconds, carrying with it the ureteral orifice, from which the urine was ejected in a fine forcible stream. The balloon would remain fully distended as long as the flow of the urine from the orifice continued, and then it would suddenly collapse into a mass of wrinkled mucous membrane. The orifice of the right ureter was normal.

CASE II.—*Papillomatous Ureteritis associated with Stricture*

at the Orifice of the Left Ureter. Tuberculosis of Kidney. Nephro-ureterectomy. Cure.

R. A., aged thirty-five years; male. Complaint, pain in the left side and back. Family history negative. Past history unimportant; has never had gonorrhœa.

Present illness began three years ago, with an attack of severe pain beginning in the left lumbar region, and radiating from there downward into the left groin and to the end of the penis. This attack lasted about one-half hour, and the patient remained free from pain for about two weeks, when another attack similar to the first came on. Since then these attacks have come on at intervals varying from two days to a week or more. They were always similar in character, were never associated with hæmaturia nor pyuria (according to the patient), and no calculus has ever been passed. Of late he has had fever and night sweats, and micturition has become more frequent, occurring about every two or three hours.

Physical Examination.—A healthy looking man; lips of good color; no arteriosclerosis. Chest well formed; lungs and heart negative. Abdomen full and rather fatty, and examination therefore unsatisfactory. Neither kidney palpable, and no tenderness on deep pressure over them nor along the course of the ureters. Genitalia normal; no urethral discharge.

Rectal Examination.—Prostate and seminal vesicles indurated and tender, but the secretion obtained by prostatic massage is practically normal and contains no pus-cells. No enlargement of the left ureter can be made out.

Urine.—All three glasses cloudy. Microscopically, pus-cells; no bacteria present (later, tubercle bacilli were found).

Cystoscopic Examination. Nitze plain cystoscope easily introduced. There is a moderate amount of inflammation present in the region of the trigone. The orifice of the right ureter is normal in appearance, and from it there are emitted spurts of clear urine. The region of the left ureteral orifice is distinctly abnormal; the ureteral ridge is much enlarged, and at that point where the orifice should be there are numerous polypoid processes of mucous membrane which wave to and fro in the vesical fluid. The ureteral opening cannot be seen, and no fluid is seen spurting from that side.

Ureter Catheterization.—Casper's instrument introduced, and

the right ureter catheterized with ease. The urine collected from it contains a few blood-corpuscles, but is otherwise normal. It is impossible to catheterize the left ureter, the orifice of which is hid among the polypi described above. Although the catheter has been pushed among these in various directions, the point fails to engage, and it is evident that a stricture is present.

Note.—The appearance of the left ureteral orifice made it evident that there is considerable disease of that ureter above, probably associated with renal lesion. Tubercle bacilli have not yet been demonstrated. Several X-ray pictures were taken with negative results. Although the diagnosis was therefore inconclusive, the cystoscopic demonstration of the left-sided urethritis with stricture, taken along with three years' history of intermittent attacks of pain in the region of the left kidney, was sufficient to render operative exploration advisable.

Operation.—On October 1, 1902, the left ureter was exposed extraperitoneally through the lower half of Israel's incision. It was considerably enlarged (one centimetre thick), and its walls were thick and hard. This condition extended down to its junction with the bladder and up to the kidney. There was no calculus present. In order to explore the kidney, the wound was enlarged upward. There was no thickening of the fatty capsule, but the kidney was congested, enlarged, lobulated, and at its lower pole focal areas of suppuration were present.

Complete nephro-ureterectomy was performed, the ureter being divided, after ligature with catgut, in its juxtavesical portion.

The patient made a good recovery. The specimen showed miliary tuberculosis of the kidney, pelvis, and ureter.

CASE III.—Chronic Sinus of the Left Side supposedly due to Necrosis of the Ribs. Cystoscopic Demonstration of Atrophy of Left Side of Trigone Contracture of Orifice of Ureter, and Absence of Urinary Function. Operation: Kidney found destroyed by Calculi. Nephrectomy. Cure.

S. C. W., aged twenty-one years; male. Referred by Dr. Hicks, of San Antonio, Texas. Complaint, "running sore on back." Family and past histories negative. No typhoid. No cough. Present illness. Patient says his mother tells him that at the age of four years he began to have attacks of pain in the

left side, which was followed by considerable swelling there, but would gradually subside. From this time until sixteen years old these attacks came on at intervals varying from one to several months, and although the swelling was at times considerable and the skin looked red, "no abscess formed." Between attacks he would often have a dull aching pain beneath the ribs and in the left lumbar region. In May, 1897, after an attack of dysentery, a severe "attack" came on, and his physician found that an abscess had formed which required opening. A large amount of pus was evacuated. Since then a fistula has persisted at the site of the incision, for which he has been operated upon twice, the diagnosis of necrosis of the rib having been made, but no good has resulted. During the past four years (since the beginning of the fistula) he has been free from the attacks of sharp pain, but there has been a dull ache present in the region of the left sacro-iliac synchondrosis.

There have never been any urinary symptoms, with the exception of one month in 1891, when he suffered with incontinence of urine and vesical irritability. He says his urine has always been clear, and that he had never passed a calculus. He voids his urine at normal intervals, and complains only of the persistence of the fistula and the pain in the left sacral region. He has never had any form of paralysis. Since the abscess was opened, nothing but a small amount of pus has escaped from the fistula.

Examination.—Patient poorly nourished, anæmic, very nervous. Pulse rapid, but heart sounds normal, lungs negative. The right kidney is movable and larger than normal. The left kidney cannot be felt. There is no tenderness on deep palpation over it or along the course of the ureter. Beneath the middle of the twelfth rib on the left side is a sinus, into which a probe passes upward and inward for five centimetres. There is no roughness elicited by the probe.

On rectal examination the prostate seems normal in size; the seminal vesicles are not palpable. Urine clear, no shreds; acid, 1020, no albumen, no sugar. Microscopically negative.

Note.—Although there was very little in the history to suggest renal disease, cystoscopic examination was performed more from the desire to make the examination complete than from the hope of finding anything abnormal.

Cystoscopic Examination.—The vesical mucosa is normal in

appearance, but there is a marked difference in the two sides of the trigone and their respective ureters. On the right side the trigonal muscles are about normal in size; large jets of urine are frequently ejected from the ureteral orifice, accompanied by active contraction of the muscles of that side of the trigone and the ureteral ridge above. On the left side, the edges (or boundaries) of the trigone cannot be seen; the ureteral orifice is much contracted,—pin-point in size, flat with the surface, the lips being absent; there is no intermittent contraction of the muscles of that side of the trigone or of the ureteral ridge to be seen, and no urine is coming from the ureter.

Remarks.—The contrast was so marked, the pictures of the two sides so different,—the right ureter surrounded by hypertrophied muscles and secreting abnormally a large amount of urine, the left not functioning at all, its orifice and surrounding muscles atrophied,—that a diagnosis of calculus of the left kidney with long-standing blocking of the ureter was made. The lumbar fistula was thus explained.

Several radiographs were then taken by Dr. C. Deetjen and, much to our satisfaction, showed five shadows of varying size in the region of the left kidney.

On October 28, 1902, I removed the kidney by the lumbar route. The fistula was found to lead past the ribs to the kidney, which was much smaller than normal, the cortex being almost entirely destroyed, and merely forming a sac for the contained calculi. There was so much perirenal fibrous tissue that the nephrotomy was extremely difficult, requiring preliminary resection of the twelfth rib. The ureter was completely blocked at its upper end; below that it was abnormally small, thin, and empty. The patient made an uninterrupted recovery, and returned home well.

CASE IV.—Calculus impacted in the Intravesical Orifice of the Left Ureter. Detected by the Cystoscope and extracted by Means of a Ureter Catheter.

S. B., aged thirty-one years; male. Admitted to the Johns Hopkins Hospital July 8, 1901. Complaint, "kidney trouble." Family history. Patient's mother is supposed to have died of stone in the bladder.

Past history. About seven years ago, the patient, in good health at that time, was suddenly seized by a severe pain in the

region of the left kidney. This lasted about an hour and was relieved by morphine. There were no other symptoms during the attack that the patient noticed. Six months later sudden and severe pains attacked the patient in the left kidney, accompanied by vesical tenesmus, painful and frequent micturition, the desire not being relieved by passage of urine, and pain along the urethra often radiating to the end of the penis. These symptoms persisted about a week with more or less severity and then gradually disappeared. Since then patient has had no decided attacks, though at irregular intervals he was troubled by slight pain and discomfort in the left kidney.

Present illness. During the first week in April, patient was seized with a severe pain in the left kidney, which continued for several hours, and was only relieved by morphine. This was accompanied by other symptoms, but two days later the patient felt the pain about the neck of the bladder, and had a constant desire to micturate, the act giving him no relief. He also suffered from severe pain at the end of the penis. At times he urinated freely, but at others something seemed to keep the water from coming. Crises of pain usually occurred twice in the twenty-four hours. These symptoms have continued up to the present time, though the kidney pain has lessened, while that about the neck of the bladder has increased, and he now has an almost constant pain in the end of the penis, and twice during the day he has had a colicky pain in the left side.

Examination.—Patient a strong, well-nourished man. Heart and lungs negative. Abdomen held tense, rendering palpation difficult. Liver, spleen, and kidneys are not palpable. Genitalia. Left testicle is markedly retracted (of recent occurrence). Penis normal, but meatus quite small. Rectal examination. Prostate a little enlarged; there is a distinct tenderness chiefly up in the median line, pressure causing great pain, and slight induration is felt at the tender point. A searcher passed into the bladder detected no definite stone, but a slight grating sensation was present. (This was followed by a chill and pyrexia of 105° F.)

On admission, the patient's urine was acid, 1018, no sugar, a trace of albumen, white and red blood-corpuscles, calcium oxalate crystals; no bacteria seen.

July 9, 1901. A meatotomy was done to allow more room for a subsequent cystoscopic examination.

July 19, 1901. *Cystoscopic Examination*.—Detection of small calculus impacted in the left ureteral orifice. Calculus dislodged by instrumentation with ureteral catheter and Casper's cystoscope.

The patient was prepared for an aseptic examination, and after careful irrigation of the bladder the Nitze cystoscope was introduced. The bladder was found to be normal. The prostate showed no intravesical hypertrophy. The right ureter was normal in appearance, functioning regularly, and the urine ejected was clear. In the region of the left ureteral orifice a small, irregular mass projected into the bladder cavity. At first it looked like a mass of fibrin, but after repeated washings of the bladder it was seen to be a small, dark calculus, which was caught in the mouth of the ureter. The surface of the calculus was very irregular and several small, sharp processes were seen. It appeared to be three to four times as large in diameter as the end of the ureteral catheter, though it was not spherical in form. It did not completely fill the ureteral orifice, and to one side there was a patency through which a fine stream of urine was ejected. The ureteral ridge was considerably enlarged, apparently indicating that the ureter was dilated.

An attempt was now made to pass a ureteral catheter into the small opening left by the incomplete blocking of the calculus of the orifice, but in so doing the stone was pushed back into the ureter for a short distance, leaving a round, patulous ureteral orifice with thickened edges. On withdrawing the catheter the stone followed it, again presenting itself at the ureteral orifice, but there lodged. It was now decided to attempt to dislodge the stone by lateral pressure with the end of the catheter, *i.e.*, to prize it out of the ureter if possible. The prism of the catheterizing cystoscope was therefore placed near the stone and the catheter made to lie in a direction at right angles to that of the ureter, and with the tip of the catheter against the side of the calculus. *Pressure was then made against the calculus by pushing the catheter, but the former was held so tight in the ureteral orifice that it only swayed to and fro under the force exerted on it, but was not dislodged. After several exciting attempts, strong lateral pressure was obtained closer to its point of detention, and the calculus was finally prized out of the ureter and fell to the floor of the bladder, leaving a large hole,—the dilated ureteral orifice.* This manœuvre caused considerable hæmorrhage from the ureter

and prostate, so clouding the fluid in the bladder that the cystoscope failed to locate the stone in the bladder. Bigelow's evacuator was now used without success, and the patient was returned to the ward, with the instructions to preserve and filter all the urine he passed. Patient says that he was immediately relieved by the cystoscopic instrumentation of the pain which he had suffered, and has had none since. A slight chill and rise of temperature followed instrumentation.

July 11, 1901. This morning, about forty hours after the cystoscopic examination, the calculus was passed during urination. It is of dark brownish-black color and about six millimetres in diameter and three millimetres thick, the surface is rough with sharp, irregular processes and spicules. There was no pain produced by its passage through the urethra, and, in fact, the patient was not aware that it had escaped until it was found in the urine voided. The patient says that he has had no return of pain in bladder, penis, or kidney since the cystoscopy.

July 12. Patient has for five days suffered with pyrexia, which began with a chill following searching the bladder for calculus two days before cystoscopy. To-day a definite epididymitis is present. There is no pain in the bladder or kidney.

July 17. Patient is still free from pain, except that in the epididymis, which is not very slight. The urine is slightly cloudy and contains cocci and bacilli, but no red blood-corpuscles.

Cystoscopic examination shows a slight acute cystitis. The orifice of the left ureter is still large and gaping, but smaller than before.

No stone is present. Patient discharged.

March, 1901. Patient returns for examination; says he has had no return of renal colic. Examination with cystoscope shows the left ureter much smaller than when last seen. No calculus present.

CASE V.—*Calculus impacted in Left Ureter for probably Twenty-seven Years. Removal by Extraperitoneal Ureterolithotomy through an Iliac Incision. Lateral Cystotomy and Intravesical Ureterotomy for Stricture of the Intramural Ureter. Cured.*

W. B., aged twenty-nine years, married, on August 28, 1901, consulted me for bladder and kidney trouble. Past history. Had gonorrhœa eleven years ago, a fairly mild attack, but accompanied

with epididymitis. He thinks he was completely cured. Has never had any serious illnesses.

Present illness. Ever since childhood has had more or less constant pain in the region of bladder and left kidney. Patient thinks this began when he was about two years of age, and has never been entirely free from it during these twenty-seven years. There has generally been a dull aching pain more or less constantly present in the region of the bladder, and a sore feeling in the region of the left kidney. At intervals of two weeks or more he has had attacks of pain of great severity located in the neck of the bladder and radiating from there along the urethra to the glans. At times the pain is also severe in the left lumbar region. There has never been a retraction of the testicle. These attacks often come on suddenly and last for two or three days; they are always accompanied by hæmaturia and never by frequency of urination.

The attacks as outlined above have continued up to the present time. He has now a dull aching pain in the region of his bladder, and the soreness extends up to the left kidney. These symptoms are sufficient to give him considerable discomfort all the time. He has no sharp attacks of colic, and micturition is apparently perfectly normal.

Examination.—Patient is a well-nourished man; lips of good color; heart and lungs negative; no tenderness in the region of the left kidney nor along the ureter. Genitalia normal, no urethral discharge, urine clear, no shreds, very acid in reaction. Microscopically negative. Prostate per rectum somewhat enlarged; there is a nodule in the region of the ejaculatory duct, nothing abnormal felt above the prostate, and no tenderness.

September 3, 1901. Urine to-day is slightly reddish in color, and under microscope red blood-corpuscles are found.

September 4. *Cystoscopic examination. Catheterizing of ureters, discovery of a stricture of the left ureter.* The mucous membrane was everywhere normal except in the region of the left ureter. The end of the left ureter was located in a considerable ridge. This ridge was much larger than normal. Just to the outside of the mouth of the ureter, which was round in shape and much smaller than normal, there was a deep depression in this ridge. To the outside and back of this the ureteral ridge projected far into the bladder almost as a septum, on each side of which

was a fairly deep pouch, around which the bladder-wall was considerably trabeculated. The mucosa along this ridge, and especially in the region of the ureter, was very red in color, and much rougher than normal. The right ureter and region around it were normal in appearance. The Casper ureter cystoscope was then introduced and the catheter inserted into the mouth of the left ureter. Almost immediately the mucous membrane of the ureteral opening became invaginated, and seemed to be drawn along by the catheter, which would only pass for a short distance (about one centimetre). Several attempts were made to introduce the catheter farther, but without success, and no urine was obtained from it. The conclusions reached in regard to the left ureter was as follows: The lower end was strictured. The ureter just above it (the intramural portion) was much dilated, producing the bulging of the bladder-wall over it, in which a stone probably lay.

The right ureter was normal in appearance and the catheter entered easily, but would only proceed for a distance of about four centimetres, when the same invagination occurred (probably owing to a congenital narrowing). A small amount of urine was obtained from this ureter, showing nothing abnormal except a few red blood-corpuscles, which were thought to be due to traumatism.

September 15, 1901. An X-ray photograph taken by Dr. C. Deetjen shows a distinct shadow of a calculus in the region of the left ureter, at about its junction with the bladder. The shadow is two centimetres long by one and one-half centimetres wide, and oval in shape. It is seen just to the side of the shadow of the coccyx, about two centimetres from the median line of the pelvis. There is no other stone to be seen. Another plate taken higher up shows a larger shadow for the left kidney than for the right, but no calculus. An X-ray plate taken by Dr. Sampson, of the Johns Hopkins Hospital, shows a calculus of the same size, and in the same location in the pelvis, as described above. The shadow here is seen about three centimetres to the outside of the median line opposite to the tip of the coccyx.

October 15, 1901. The patient has been under observation for six weeks. During this time he has had an almost constant dull aching pain in the left kidney, and a pain of a little greater severity which he says is deep-seated and apparently located back

of the symphysis pubis, and from there at times extends along the neck of the bladder to the end of the penis. Micturition has no effect upon these pains, and is of normal frequency.

During this time blood was at times present and at others absent. On September 13 the hæmaturia was considerable. When free from blood the urine contained no albumen.

Operation, October 16, 1901.—Extraperitoneal Ureterolithotomy. Extraction of a Stone from the Juxtavesical Ureter. Ureteral Wound closed. Lateral Cystotomy. Intravesical Ureterotomy for Stricture of Intramural Ureter. Closure of Bladder. Cured.

The abdominal incision, seven inches long, was made from a point about the middle of Poupart's ligament, upward and outward, passing about an inch from the spine of the ilium. As soon as the peritoneum was reached it was elevated by the fingers, and the stripping process carried rapidly downward over the iliacus and psoas magnus muscle and the iliac vessels easily exposed. Search was then made for the ureter, bearing in mind the fact that it was generally to be found adherent to the elevated peritoneum. The peritoneum was found very much thickened, and the tissue greatly changed by fibrous hyperplasia. Nothing simulating the normal ureter could be found, but in the place where it should be a large coil of about the size of a small intestine was found. On account of its great size and because it seemed to be intraperitoneal, this was not supposed to be the ureter until after the wound had been carried upward and outward exposing the kidney. The pelvis was found greatly dilated, and coming from it a very greatly dilated ureter was found. This proved to be that which was before supposed to be the intestine. The ureter was two and one-half centimetres in diameter and considerably convoluted. It was separated by blunt dissection from the peritoneum to its junction with the bladder, at which point a stone was felt (Fig. 9), and after some little pressure against its deepest end with the finger, this was dislodged, and gradually pushed upward in the ureter until it reached a point about five inches from its lower end. Drawing the ureter taut around it and using the stone as a bobbin (Fig. 10), two mattress sutures of fine silk were placed in the ureter over the stone. An incision was then made and the stone removed. It proved to be a calculus two centimetres long, one and one-half centimetres wide, and one and one-fourth

centimetres thick. It was very hard and generally smooth, and showed broad grooves which had been worn away by the urine. The stone was apparently composed of alternate layers of urates and oxalates. After removing the stone from the ureter a metal probe was inserted, and search was made for other stones upward and downward in the ureter, but none were found. Attempt was then made to pass the probes, catheters, and the ureteral dilating instrument devised by Dr. Kelly through the lower end of the ureter into the bladder, but without success.

Operation for the Stricture.—The points of small instruments apparently engaged in its lower end, but would not pass into the bladder. Remembering the fact that it was impossible to pass a ureter catheter for more than a short distance into the ureter during the previous cystoscopic examination, it was decided to make an opening into the bladder, and then dilate or incise the stricture from within the bladder. Another reason for dilating this stricture was that it was found impossible, by squeezing and milking the ureter, to force the urine, with which the part below the incision was distended, into the bladder and thus empty it. It was thought best to make an incision into the bladder along its left side rather than to make a new suprapubic opening in the median line. In order to do this, it was necessary to free the vas deferens from the bladder, and to push it downward so as to make an incision above it into the bladder (Fig. 11).

After the opening had been made, the fluid evacuated, and the bladder dried, several attempts were made to pass a probe into the ureter from below, but it was found to be impossible to push it more than one centimetre. Working with the small bulbous dilator of Kelly through the ureter from above, and with the finger making a counter-pressure into the bladder covering the end of the ureter, it was finally possible to push the small end of the dilator through the stricture until it appeared in the bladder (Fig. 12). Palpation with the finger then showed a distinct hard ring about one centimetre distant from the orifice of the ureter, completely encircling its caliber, and of such strength as to prevent one from pushing the bulbous part of the dilator through. The caliber of the stricture was apparently about three millimetres and the thickness of the ring about four millimetres. The very smallest Kelly dilator was next tried, but with the same result, *i.e.*, the instrument would pass until the bulbous enlargement

came against the stricture, and its point appeared in the bladder, but would go no farther. *It was then decided to divide the stricture with a knife, and an incision was accordingly made along the dilator through the mucous membrane of the bladder into the stricture until it was divided, and the instrument could pass freely into the bladder.* The incision required was probably one centimetre long, and had to be made while keeping the knife against the dilator in the ureter (Figs. 12 and 13). The largest dilators and catheters were then easily passed into the bladder through the ureter from above. The incision in the bladder was closed by eight mattress sutures of fine silk, the edges of the wound being inverted. The ureter was also closed with three mattress sutures of fine silk. Two small gauze drains were inserted to provide for possible leakage of the sutured ureter and bladder.

The muscles and fasciæ were closed with mattress sutures of silver wire, and the skin closed with subcutaneous silver.

November 6, 1901. Patient's condition excellent since operation. The urine, which was at first bloody, is now almost clear. The wound was dressed to-day and a portion of the gauze drain removed, and the subcutaneous silver sutures taken out of the suture wound. Wound healed per primam.

November 13, 1901. The remainder of the drain was removed, there has been no suppuration, and at no time any leakage of urine from either the ureteral or vesical wounds.

November 21. Abdominal wound has healed completely, and patient is in excellent condition. Discharged from the hospital. He is apparently perfectly relieved.

March 7, 1902. Patient says that he has been in splendid health, and had no pain at all in the region of the bladder, ureter, or kidney, and urination is of normal frequency; his urine has been perfectly clear, and he has gained about twenty pounds in weight. Left kidney and ureter not palpable nor tender. On rectal examination a small mass is felt above the seminal vesicles (probably the cicatrix of the ureteral operation). Prostate still somewhat indurated. Urine perfectly clear and normal.

Cystoscopic Examination.—Bladder healthy, right ureter apparently normal, and functioning frequently. The left ureteral orifice is in the shape of a crescent with concavity downward and about three times as long as normal. At the outer end of the crescent a small aperture is to be seen through which the urine

comes. The usual peristaltic wave is not to be seen, but a fairly forcible jet of urine separates the edges of the outer part of the orifice. In the inner two-thirds the lips of the orifice are approximated and are not separated by the outflowing urine. The cystotomy wound in the left side of the bladder cannot be seen.

December 1, 1902. Patient in perfect health; urine normal.

CASE VI.—*Calculus impacted in Juxtavesical Portion of the Right Ureter. Demonstrated by Ureter Catheter and Radiograph. Ureterolithotomy. Suture. Cure.*

W. W. M., male, aged twenty-five years, admitted August 28, 1902. Complaint, "stone in right kidney." Family and past histories negative. No typhoid.

Present illness. Five years ago the patient was taken with a severe pain in the right side beneath the ribs, which lasted for six hours, and required morphine. One week later a second attack similar to the first came on, and again, after a week's intermission, the third attack. In all three the pain remained localized to the right side and back, and was not associated with hæmaturia or vesical irritability.

In December, 1900, after a respite of three years, he had an attack of pain which began in the right testicle, but soon travelled from there up to the kidney. After that four similar attacks occurred, about one month apart, the last being associated with hæmaturia, and followed by the passage of a small calculus. He was then free from pain until September, 1901, since which time he has had attacks at intervals of one to three weeks up to the present time. "The pain always begins in the right testicle and ends in the kidney." He has not passed a second calculus; there has been no urinary disturbance, no blood. Between attacks he has felt well, with the exception of a dull pain which is located deep down in the pelvis ("in the region of the bladder"), and is sometimes more severe after micturition. He has had no pain in the end of the penis.

Examination.—The patient is pale and extremely neurotic. Chest and abdomen are negative. Palpation of the abdomen is difficult, but there is no tenderness over the kidney or along the ureter. Rectal examination reveals nothing abnormal. Urine, clear, acid, 1020. No albumen, no sugar; a few shreds are present which are found to be composed of pus-cells; no bacteria present.

Cystoscopic examination with the plain Nitze instrument

showed a normal bladder. The ureters were both functioning, the fluid coming from each clear, and nothing present to indicate disease higher up on either side. Casper's catheter cystoscope was then introduced and the right ureter catheterized. After the catheter had passed upward for a distance of about four centimetres an impassable obstruction was encountered. Although considerable force was used, the catheter would proceed no farther, but always doubled on itself. To our surprise, however, we found that urine was flowing intermittently from the catheter, so that it was not withdrawn, but held carefully in place until a quantity sufficient for examination was obtained.

Urinalysis of this specimen showed much less urea than that of the voided urine. There was no pus present, but numerous pear-shaped epithelial cells were seen. The diagnosis of calculus of the juxtavesical ureter was made, and the patient was sent to Dr. C. Deetjen for X-ray photographs.

Radiographs.—Several radiographs were obtained. These showed nothing in the region of the kidney, but on the right side of the pelvis, corresponding to a point in the ureter about two centimetres above the bladder, a small oblong shadow was shown (about one by one and one-half centimetres in size). In order to determine accurately its distance above the bladder, I injected into the bladder eighty cubic centimetres of a heavy suspension of bismuth in water, and then had Dr. Deetjen take another photograph. This showed a large transverse oval shadow (the bladder), and just above it the smaller shadow (the calculus).

[This method should prove of value, in the absence of the cystoscope, to determine whether a calculus were situated in the bladder or above it.]

September 10. Urine voided in past twenty-four hours, 710 cubic centimetres. Total amount of urea, 18.5 grammes.

September 11. Total urine, 2200 cubic centimetres. Total urea, 20.5 grammes. The patient is in excellent condition. The urine is not infected. Operation advised (extraperitoneal ureterolithotomy) and agreed to.

Operation, September 12.—*Extraperitoneal Ureterolithotomy. Dilatation of Ureteral Stricture. Closure of Ureter with Sutures.*

An incision corresponding to the lower half of Israel's incision was made, the peritoneum stripped up from the iliac muscles and vessels, and the ureter found incorporated in the elevated

peritoneum. As in the other case (V), it did not stand out plainly visible on the posterior surface of the peritoneum, but instead was almost surrounded by the latter, to which it was so intimately adherent that only by palpation between the thumb and finger was the thickened tube felt and finally freed from its perineal bed. The ureter was one centimetre in diameter, its walls thickened and somewhat congested. After it was once discovered and freed it was an easy matter to follow it down its intrapelvic course, and there at a point one and one-half centimetres above its juncture with the posterior surface of the bladder a calculus was felt tightly impacted in its lumen and surrounded by considerable extra-ureteral scar tissue. The stone, which was about eight by fourteen millimetres in size, was dislodged with the finger from its incarceration, and "milked" upward until a point in the ureter above the pelvic brim was reached. Using the calculus as a bobbin, the sutures were put in before the ureter was opened, as in Case V.

After extraction of the calculus, small bougies, passed down the ureter, detected a stricture just below the site of the calculus. After considerable manipulation, a very small bougie was passed through the stricture, and followed by successively larger ones until the caliber was larger than normal. After exploring the higher ureter and renal pelvis with probes and finding no stone, the previously placed sutures were tied, thus tightly closing the ureteral wound.

The abdomen was closed as usual, a small drain leading to the ureteral incision having been provided.

The patient made a rapid recovery. The gauze drain was removed on the tenth day. There was no leakage of urine.

January, 1903. Patient has completely regained his strength and health. He is entirely free from the dull pain which he had before operation; urine normal.

CASE VII.—*Hæmaturia of Four Years' Duration. No Pain. Detection by Cystoscope of a Large Pedunculated Tumor of the Bladder, involving Region of the Right Ureter. Complete Extirpation by Suprapubic Cystotomy. Cure.*

J. D., aged sixty-five years; male. Admitted August 5, 1902. Complaint, "hæmaturia." Family history negative. Past history. Patient says he always had a tendency to bleed from small cuts more abundantly than other people. Had numerous and

prolonged attacks of epistaxis up to six years ago. A brother suffered similarly, but no other members of the family did. No previous history of urinary disturbance. No history of intravesical instrumentation, of traumatism, of calculus.

Present illness. About four years ago the patient first noticed that his urine contained blood. He had no abnormal symptoms, no pain, no urinary disturbance, and thought the blood came from exposure to cold. In a short time it disappeared, but the urine was cloudy, and has been so ever since. About one year ago red blood again appeared in his urine, but only lasted during one day, and he was otherwise symptomless. Since then he has had four similar attacks, the last one being ten days ago, when the amount of blood was greater than before. He thinks the two voidings must have contained together one pint of blood. With the exception of the cloudy urine and intermittent hæmaturia, he has noted nothing abnormal with the exception of a slight increase in the frequency of urination; the stream of urine is large, never any sudden stoppage, and he has no discomfort before, during, or after urination, except at times a slight burning in the urethra. He has often suffered with pain in the back, but there have been no symptoms indicating disease of either kidney.

The urine, as stated above, has been cloudy since the first attack of hæmaturia. During these the blood is usually well mixed with urine, but sometimes clots are passed. There is never any bleeding from the urethra between urinations. He has not had chills nor fevers, has passed no calculus, and has lost but ten pounds in weight. General health fairly good.

Examination.—The patient is well nourished, the mucous membranes of good color. Pulse 60 to the minute, vessel wall moderately thickened. Lungs normal. Heart, slight systolic murmur present at apex; other sounds clear. Abdomen negative, with exception of slight tenderness in the lower left quadrant of the umbilical region. Neither kidney palpable nor tender.

Urinalysis.—Slightly smoky, acid, 1021, albumen considerable, no sugar. Microscopically, many pus-cells; moderate number of red blood-corpuscles, no casts. Stained specimen of freshly voided urine shows numerous long and short bacilli.

Rectal examination. Prostate slightly enlarged and indurated, surface smooth, rectal mucosa not adherent.

Cystoscopic Examination.—A catheter passed easily and very

little residual urine was found, but hæmorrhage was at once produced, and after numerous injections the fluid still came away cloudy with blood. The cystoscopic examination was therefore unsatisfactory, but it was enough to determine that a large intravesical tumor was present, though the region of the bladder from which it sprang could not be made out. The patient was advised to submit to an exploratory suprapubic incision, but preferred to await developments.

Second Admission.—In February, 1902, the patient returned for operation. He reported that his urine had been free from blood during the Fall, but that the hæmaturia had returned later, and at times the loss of blood was considerable. Micturition had also become more frequent, but there was no difficulty in voiding. Recently the urine had been clear. On examination the patient was found to have lost weight, and was paler than before. The urine was much clearer than before, and contained no blood; pus-cells and bacteria present in moderate number. Prostate as before.

Cystoscopic Examination.—No hæmorrhage was produced by the catheter and a clear view was easily obtained. A large globular tumor was seen springing from the region of the right ureteral orifice by a broad pedicle. The surface of the tumor was rough, in places fissured, but not villous in type. No ulcerated areas were to be seen. The pedicle covered completely the orifice of the right ureter, preventing its detection. No urine was seen coming from that region. The adjacent bladder-wall looked healthy. The left ureter was functioning actively, and its orifice was normal in appearance.

Operation.—*Suprapubic cystotomy. Excision of tumor. Partial closure of bladder and abdominal muscles. Drainage. Cure.*

A long skin incision was made in the median line, the bladder opened, tumor located and found to be about five centimetres in diameter, globular in shape, with a short pedicle about two centimetres thick springing from the region about the right ureteral orifice.

In order to obtain good exposure, the peritoneum was stripped back from the vertex and upper portion of the posterior wall of the bladder. In accomplishing this, it was necessary to divide the urachus. [I have frequently employed this procedure and

found that it affords at once a splendid view of the interior of the bladder through the long incision which can be made after the perineum is stripped back. This procedure obviates entirely the necessity of transverse abdominal incision, or symphysiotomy, and other bone plastic methods which have been advocated as necessary for adequate exposure of the interior of the bladder.]

With the abdominal retractors placed so as to include the bladder-wall on each side, the pedicle of the tumor was within easy reach, and a long curved clamp was placed across it. As this clamp happened not to be close enough to the bladder-wall, traction was made by means of it on the pedicle, thus elevating a portion of the bladder-wall with it, and a second clamp was slipped on beneath it. [By thus taking successively "lower holds," a clamp may be placed very high up at the base of the pedicle.]

Not wishing to ligate the pedicle on account of its relation to the ureter, we cut it with a Paquelin cautery, the blade of which was kept in close contact with the under surface of the pedicle clamp. When the division was complete, the bladder-wall at once retracted, showing a depressed raw area about two by three centimetres in size, in which the ureter opened, and in which two or three small bleeding arteries were seen, clamped and ligated with catgut. Complete hæmostasis was thus obtained. The remainder of the operation consisted in closing the bladder and the abdomen (partially) with catgut, and providing intravesical gauze and tube drainage.

The patient stood the operation well. The convalescence was interrupted by a breaking down of the sutured muscular wound, but the patient ultimately made a good recovery. Cystoscopic examination, six months later, showed a practically normal bladder. The scar of operation could be hardly seen, and the orifice of the right ureter, which lay in it, was large and functioning well. The patient had regained his health completely. One year later he is still well.

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CONTRIBUTION TO THE SUBJECT OF PERINEAL PROSTATECTOMY.

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THE following case is reported partly because it offers some peculiar points in itself, and partly because it has some interest from the stand-point of the general surgeon in a phase of his work in regard to which the writings of specialists still give him diametrically opposed advice.

T. S., sixty-three years old, a boiler-maker. Denies venereal history. A moderate user of alcohol, and has been in excellent health until the onset of his prostatic trouble.

About five years ago he began to have some pain and difficulty in urination. This trouble was not severe at first, and he was able to empty his bladder fairly satisfactorily till four years ago, when he entered the Moses Taylor Hospital on another's service with what was apparently an attack of acute retention. His urine was drawn off by a catheter. He remained in the hospital at this time for a month, during which it was necessary to pass a catheter several times.

Since leaving the hospital, four years ago, he has never been able to void his urine naturally, and his story becomes that of an absolute catheter slave. In a short time he infected himself, as is shown by an attack marked by a painful swelling of the testicle which laid him up for three months.

The frequency of catheterization gradually increased, till lately it has had to be performed six or more times a day, and sometimes ten or twelve times at night. Pain and strangury became severe, and often, when the desire for the catheter came, he would be "doubled up with pain" before he could reach a suitable place. The urine became so thick that it would often block the catheter and necessitate its being removed and washed. For the past several months the urine has always contained a consider-

able amount of blood. The pain, the constant discomfort of catheter life, and the continued loss of sleep soon told severely on his health. He became emaciated, weakened, and in general reduced to a very pitiable condition, which brought him to the hospital ready to accept any risk rather than to continue unrelieved.

On admission to the Moses Taylor Hospital, September 6, 1902, examination showed a much emaciated man with marked senile changes. His face was drawn and haggard as the result of his years of suffering. Abdominal and thoracic viscera normal. Arteries thickened and tortuous. Prostate large, smooth, and hard. Its upper border cannot be reached by rectum. A soft rubber catheter passed after a little patience. It was not considered best to attempt any metallic instrumentation of the urethra.

After preliminary irrigations, the modified Alexander's operation was performed, September 13, with the assistance of Drs. Burns and Connell. Ether anæsthesia. A median incision was made over the pubes and the finger passed bluntly down the pre-vesical space till the prostate was reached and controlled. The bladder was not opened. A sound was passed into the bladder to identify the urethra in the deep tissues, and an inverted Y-shaped incision made in the perineum. On bluntly separating the tissues to expose the prostate, a ragged hole was torn in the rectum, much to the operator's disgust. This was ignored for the moment, and the enucleation of the prostate proceeded with. The right lobe was first shelled out, bringing with it a bar of tissue representing the middle lobe and a piece of the floor of the urethra. The left lobe was much higher up than the rest of the gland, but was reached and shelled out without difficulty. The greatest assistance was received all through the operation by the pressure from above.

Attention was then directed to the rent in the rectum. Although the operation had taken only a short time and was attended with very slight loss of blood, it was nevertheless desired to return the patient to bed as soon as possible on account of his previously weakened condition. An accurate suture of the rectal wall was therefore not attempted. A purse-string suture of chromic gut was placed around the tear and tied after the wall was inverted into the lumen of the bowel. A rubber tube surrounded by gauze was inserted into the anus and the rectal accident was not heard from after.

The bladder and operative field were thoroughly irrigated and a soft rubber catheter fixed in position in the perineal wound. The suprapubic wound was sewed tight and healed *per primam*.

There was very little reaction following the operation. The night after the operation was the "only comfortable one for years." The perineal tube was removed on the ninth day, and then sounds were passed every three days.

The opening in the urethra was somewhat large, as was also the cavity formed by the removal of the prostate and the sagging down of the tissues due to the Y incision. This gradually closed, and on the twenty-ninth day urine began to come through the penis. Progress continued very satisfactory till the forty-ninth day, when, during the passage of a sound, a stone was felt in the bladder. This had given no evidence of its presence since the operation.

The perineal sinus being open, it was still further dilated under ether, and the stone easily removed by this route without crushing. The calculus was smooth, egg-shaped, one inch in its longest diameter, and weighed 175 grains.

This second procedure naturally delayed the closure of the perineal sinus, which did not take place till the thirty-ninth day after the second operation. This period of convalescence is an unusually long one, but during it the patient was absolutely free from discomfort, and gained forty pounds in weight.

At the present time, four months after the first operation, the patient has absolute control of the bladder and urinates with perfect freedom. The bladder is at times completely emptied, and at times contains a small amount of residual urine. The amount apparently depends solely on whether the patient takes pains to empty his bladder thoroughly. He urinates now three or four times a day, sometimes sleeping straight through from 9 P.M. till 5 A.M., and sometimes getting up once during the night. The urine is only slightly cloudy. The bladder easily holds twelve to fourteen ounces of irrigating fluid.

The result seems to be a complete cure from the stand-point of both patient and surgeon.

There are three interesting features in the case:

- I. The discovery of a stone seven weeks after operation. This was undoubtedly present at the time of operation and

escaped detection, notwithstanding the pressure from above and the insertion of instruments into the bladder several times during operation. This circumstance lends an argument to Alexander's original operation of opening the bladder. It is admitted that in this case the possibility of a stone as an additional factor was not kept in mind. If a thorough search had been made with this in view, the stone would probably have been found and could have been removed through the perineum intact or after crushing.

2. The tearing of the rectum. It is freely confessed that this is the operator's first case, and that tearing the rectum is wholly unnecessary, especially when the prostate is being exposed preparatory to shelling it out. The accident was instructive, however, as showing the good result obtainable in the rectum after a simple purse-string suture with inversion of the bowel wall. The procedure is comparable to the ordinary purse-string treatment of the appendix stump. It is the same general principle as the Kader gastrostomy which has been applied to the urinary bladder by Gibson, to the gall-bladder by Abbe, and to the cæcum by several surgeons. Senn has recently advocated the purse-string suture in the primary closure of stomach wounds, and it has doubtless been employed a number of times in rectal surgery.

3. The demonstration of the availability of the operation for the general surgeon. In a large degree the criterion of the usefulness and permanence of any operative procedure lies in the safety and benefit with which it can be applied by the general surgeon,—not by the inventor of the procedure, who himself may have had to perform it scores of times before it was perfected even in his hands. A surgeon on studying an operative procedure which he is called upon to do the first time, or at long intervals, can gain no aid from reading that one distinguished specialist has attacked an organ in one way hundreds of times with a certain percentage of cures, and that another, equally distinguished, has performed a like number of operations with like results but in an absolutely different way. What

the general surgeon wishes to know is what operations yield good results to others similarly situated. Percentages of mortality and cure, in order to aid him, must be compiled from a large number of cases from many surgeons. It is designedly therefore from the stand-point of a novice in this branch that the above report is offered.

RUPTURED CRUCIAL LIGAMENTS AND THEIR REPAIR BY OPERATION.¹

BY A. W. MAYO ROBSON, F.R.C.S.,

OF LEEDS,

Consulting Surgeon to the General Infirmary at Leeds.

AT first sight it would appear that an accident capable of rupturing the crucial ligaments of the knee would lead to complete disorganization of the joint; but the case that I am about to relate demonstrates not only that the crucial ligaments may be ruptured without serious damage to the joint as a whole, but that their repair by operation is both feasible and hopeful as to its ultimate result.

J. B., aged forty-one years, a miner, residing at Featherstone, was admitted to the General Infirmary at Leeds, November 4, 1895, on account of lameness from weakness and instability of the right knee, resulting from an accident when at work in a coal-pit thirty-six weeks before, when he was almost buried by a fall of earth, and sustained, besides the injury in question, a fracture of the left leg and of three ribs on the left side as well as internal injuries. After being in a neighboring hospital for six weeks he was made an out-patient, but returned in a fortnight on account of the right knee, which kept him in hospital for another six weeks, at the end of which time it was, he says, no better.

When admitted to the Leeds Infirmary, the knee was swollen but free from tenderness on manipulation. When the muscles were braced up, the bones were in good position, but as soon as the muscles relaxed, the tibia fell backward until stopped by the ligamentum patellæ. On manipulation the head of the tibia could be brought forward in front of the femur, and there was also very free lateral movement of the head of the tibia on the femur; some fluid in the joint could be felt and the patella floated. It

¹ Read at the Clinical Society of London, December, 1902.

was manifest that not only were all the ligaments relaxed, but that the crucial ligaments had been ruptured.

Operation, November 21. The joint was opened by an incision starting at the most prominent part of the internal condyle and passing downward and outward, crossing the ligamentum patellæ about the middle and extending upward to the prominence of the external condyle. On opening the joint the synovial membrane was found red and injected, and there was an excess of synovial fluid. Both crucial ligaments were found completely ruptured, being torn from their upper attachments, the ends being in a somewhat shreddy condition. They were stitched in position by means of catgut ligatures, the anterior being stitched to the synovial membrane and tissues on the inner side of the external condyle, and the posterior, which was too short and was split in order to lengthen it, was fixed by sutures to the synovial membrane and cartilage on the outer side of the inner condyle. The wound was then stitched up by means of buried catgut sutures and was closed superficially by interrupted silkworm-gut sutures.

Some pain followed the operation, and there was effusion into the joint, but on removing a stitch a little serous fluid escaped and relieved tension, the after progress being uneventful.

December 4. Stitches removed. Edges firmly healed; there was still considerable swelling in the neighborhood of the knee.

December 14. Plaster of Paris was applied, and he was allowed to get about on a Thomas' splint and to go home. The plaster was removed in a month, after which articular movement gradually returned under treatment by massage.

At my request, my house surgeon, Mr. W. Gough, visited him on October 24, 1901, and gave me the following report. The patient describes his leg as "perfectly strong." He walks well without a limp and can run. He works eight hours a day at his old employment of "getting" coal, and has never been off work a day on account of his knee since his discharge from the Infirmary. He has no pain in the knee except when he has overworked it, when he has a little aching over the inner side of the joint. There have been no attacks suggestive of a loose cartilage.

On inspection the scar of the old incision is seen. The joint looks fuller than the other and the outlines are rather blurred, the fossæ on either side of the patella being shallower than normal.

Measurement showed practically no difference in the circumference of the joints. There is no tenderness over the joint.

Movements. No abnormal mobility whatever is present. Extension to the straight line is perfectly free. Flexion is somewhat limited, but the knee can be flexed to just beyond a right angle quite freely, when it becomes fixed, and any attempt at further flexion causes pain over the outer side of the joint. On flexion and extension fine creaking is felt in the joint. The patient says the joint is more liable to pain him in cold, damp weather.

Remarks.—As a rule, I do not care for reporting a single example of any disease or injury, but having waited seven years without another case of ruptured crucial ligaments coming under my observation, I think the time has come for the publication of this one, especially as I am able to give a report of the condition so long after operation. A search through surgical literature has not rewarded me in discovering any other case in which these deeply placed and strong ligaments have been repaired; this therefore will, I trust, be a sufficient excuse for my contribution, as it clearly demonstrates the hopefulness of operation in so serious an injury.

Since reporting the above case I find another case was operated on August 5, 1898; the woman was shown at the Clinical Society February 23, 1900, the result being quite satisfactory.

[Mr. William H. Battle, in the British Medical Journal of December 13, 1902, refers to Vol. xxxiii of the Transactions of the Clinical Society of London, p. 232, where is described a suture of the crucial ligaments as a part of the procedures adopted in the treatment of an irreducible traumatic dislocation of the knee-joint in which an open section was made. This was done August 5, 1898. The result was good.—EDITOR.]

A CASE OF END-TO-END ANASTOMOSIS OF THE POPLITEAL ARTERY FOR GUNSHOT INJURY.¹

BY ALEXANDER HUGH FERGUSON, M.D., C.M.,
OF CHICAGO,

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At midnight of October 20, 1902, Mr. E. R. W., aged thirty-eight years, was received into the Chicago Hospital, having been shot in each thigh four hours previously. A temporary anti-septic dressing had already been applied on both wounds.

Examination after admission showed:

(A) *Right Limb*.—1. Bullet wound in thigh, two and one-half inches above the patella, to the inner side from which wound there was slight oozing of blood.

2. The whole limb was obviously swollen. It measured three and one-half inches more in circumference above the patella than it did on the opposite side, and from one to two and one-half inches more around the calf and thigh. The swelling was constantly increasing.

3. Pallor of the foot was observed, but the color around the knee was darker than normal, around which the superficial veins were engorged, and evidently the deep veins were compressed by the extravasated blood.

4. Loss of function. The limb as a whole could not be used.

5. Loss of sensation and motion of the foot, and half-way up the leg was marked. He could not feel what parts were being touched or pricked, and he had no power to move his foot and leg.

6. The foot and leg felt cold, but he complained of their being hot and numb. The whole surface of the limb was not as warm as its fellow.

7. Pressure on any part of the calf, knee, and thigh caused him to complain of pain. It hurt him to have the limb moved.

¹Read before the Western Surgical and Gynæcological Association, December, 1902.

8. Diffuse pulsation in the popliteal space could be seen and felt; it extended up and down as well as around the knee.

9. A systolic bruit was heard behind the knee and a thrill was felt.

(B) *Left Limb*.—A bullet wound was situated in front of the upper third of the thigh, but gave no inconvenience or special injury to the limb other than the penetration of the quadriceps extensor muscle.

(C) *Constitutional Condition*.—Shock was quite marked; he was weak, pale, and anxious looking. His pulse was 132 per minute, small and weak. His temperature was slightly subnormal, 98° F., and respirations normal. He was quite thirsty and his voice was weak and husky. He felt nauseated, but had not vomited.

Operation.—The bullet track on the left side was cut out for about four inches downward towards the knee, disinfected with carbolic acid, 95 per cent., and that neutralized with alcohol, and then the wound packed with iodoform gauze. The ball was not then found. In the injured right lower extremity the track of the ball was cut out through the soft parts down to the femur, which was found to have been penetrated at its inner edge about two inches above the patella. A plug of gauze was packed firmly into this wound to prevent hæmorrhage. An elastic tourniquet was secured around the thigh well up so as to prevent arterial hæmorrhage. A long incision, over the course of the popliteal artery, was made, which exposed its entire length. A large quantity of liquid and coagulated blood was removed from the popliteal space and from the cellular planes up and down the limb, with the fingers, and by free flushing with saline solution at the temperature of 115° F. It seemed to me important to wash out all the extravasated blood possible in order that the hinderance to the circulation might be minimized. A flattened bullet of lead was found immediately behind the injured artery, which had not penetrated the popliteal fascia. The artery was completely severed at the junction of the middle and upper third, except a few shreds of the outer coat next the vein. Upon relaxing the rubber band, blood spurted from the proximal end of the injured artery. I tied strips of gauze around the artery, one above and the other below the injury, for temporary hæmostasis. The tourniquet was then removed. The lacerated ends,

about an inch altogether, were removed. The caliber of the proximal end of the vessel was free and open, while that of the distal was occluded with a small blood-clot, which was readily squeezed out, and which shows that there was no collateral circulation. An anastomosis by the invagination method was then carried out. The upper end was introduced into the lower a distance of a quarter of an inch and held there by four retention sutures of fine silk, and the free edge of the lower end sewed around the upper with a fine continuous suture of the same material. The temporary ligatures of gauze were then removed and the blood allowed to enter the limb. Pulsation at the ankle was restored at once, the extreme pallor of the foot disappeared, and it became warm. While restoring the continuity of the artery, the leg was flexed at a right angle. A broad flap over an inch wide from the semimembranosus muscle was lapped around the artery at the seat of union. The branches of the artery destroyed were the superior internal and external articular. The popliteal vein was intact, but in clearing out blood-clots opposite the junction of the middle and lower third, two small branches were injured and tied close to the main vein. The popliteal nerve was not injured. The wound was closed with silkworm-gut sutures except at its upper and lower angles, where gauze drainage was left. The bullet wound was also drained with gauze. A mammoth dressing was applied and the limb fixed at an obtuse angle with a plaster-of-Paris bandage, the foot being left exposed.

While on the operating table, hypodermoclysis of normal salt solution of 700 cubic centimetres, at a temperature of 115° F., and strychnine, one-thirtieth of a grain, were given. When the operation was over, his pulse was 112, temperature 100.6° F., and respirations, 20.

After-Treatment and Progress.—During the rest of the night he rested well. Strychnine, one-thirtieth of a grain, every hour was given for four doses, then every two hours for twenty-four hours. Inasmuch as there was no nausea or vomiting, he was allowed to swallow as much hot water as he desired. The next morning sensation was found to have returned in the toes and foot; the skin was normal in color and it felt warm. The urine passed during the first twelve hours after the operation was twelve ounces; it contained albumen, blood, epithelia, pus,

casts both hyaline and granular; it was acid in reaction and had a specific gravity of 1030. The second day his temperature was 100° F., pulse 118, and respirations 20, and he rested comfortably. The strychnine, one-thirtieth of a grain, was given every three or four hours hypodermically and liquids *ad libitum* by the mouth.

Noteworthy Clinical Changes.—Just forty-one hours after the operation, a sudden, severe shooting pain was felt in the calf. Up to this time the foot appeared normal. It suddenly changed in color, and sensation disappeared. When I saw him five hours afterwards, he was still complaining of pain in the calf, ankle, and foot. The foot felt warmer than normal, was slightly swollen, superficial veins engorged, sensation lost, and its color changed, and appeared by electric light to be of a darker hue. The pulsation of the anterior tibial artery at the ankle was gone.

Hot fomentations were applied to the foot and ankle. The next morning, at nine o'clock of the third day after the anastomosis, the foot was shrivelled, pale, bloodless, and senseless. The arterial supply of blood to the periphery was evidently cut off, and within the next three days dry gangrene ensued, with a slight increase of temperature, but the pulse improved, being only 90. The first dressing of the wound was changed on the fifth day through a window in the plaster case, part of the gauze was removed. On the ninth day all gauze drainage was withdrawn, the wound cleansed, and a small packing of iodoform gauze substituted. By this time (ninth day) a clear line of demarcation between the living and dead parts was pronounced. The toes, a strip down the sole of the foot, and a patch on the heel about the size of a silver dollar, as well as several spots on the outside of the foot and ankle, were dead.

First Amputation.—Inasmuch as no untoward constitutional symptoms arose, the patient getting stronger, and the wounds undergoing a natural process of repair by granulation, amputation was deferred until the thirty-first day after the injury. During this time nature was performing an aseptic separation while strict antiseptic precautions were carried out. Then the toes, along with the ends of the metatarsal bones, a broad strip along the sole, and the necrosed patch on the heel were removed by me. With the hope of saving as much of the foot as possible, the sole of the foot was left uncovered by skin. The foot was

surgically treated for four weeks thereafter, but the sole did not granulate over, but, instead, all the soft structures down to the bones necrosed, and another operation was advised.

Second Amputation.—On the fifty-first day after the injury the second amputation was undertaken, and the foot removed at the mediotarsal joint. At this time the bullet from the left thigh was removed. It was situated four inches above the patella beneath the quadriceps extensor.

March 16, 1903.—The patient is now well. He is using his limb and attending to his business. He returned to the hospital on February 12 complaining of inability to straighten his limb, owing to the cord-like condition of the scar in the popliteal space. I removed the entire scar tissue, and took occasion to examine the artery. *I was delighted to see and feel pulsation above and below as well as at the seat of the anastomosis.* This is the best evidence of the success of the operation.

In looking over the literature, I have failed to find the report of a case of anastomosis of the popliteal artery.

THE SUCCESSFUL REMOVAL OF A LARGE ENCHONDROMA OF THE CHEST WALL, INVOLVING THE DIAPHRAGM.

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Surgeon to St. Elizabeth Hospital.

THIS case was not thought to be in any way unusual until similar cases of removal of the chest wall for tumor were sought. The growth occupied the lower lateral chest wall in a man of over sixty-six. It had been growing gradually for eleven years, more rapidly of late, and now itself measured thirty-three inches in circumference, and sagged over the pelvis so much that it seemed to spring from that point. When the patient was dressed he seemed to carry a large and heavy basket under his clothes, such was the inclination of his trunk. Lobulated and of stony hardness, the skin in places thin, large superficial veins, no enlarged glands.

In operating, large skin flaps were made from the sides of the tumor, and the ribs partly divided, when it was discovered that fully a third of the growth was inside the pleural cavity and attached to the diaphragm. An opening in the chest wall the size of two hands was made, the whole pleural cavity being exposed to view, including the pulsating pericardial sac. Retraction of the lung was complete. Considerable hæmorrhage had naturally been expected, but when the mass was finally detached only three small muscular twigs required tying. The remains of the diaphragm and some fascia were brought together in one layer and the skin in another, and all spaces, including the pleural cavity, drained with gauze. The only reactions were occasional attacks of dyspnœa with rapid pulse, and on the third day a single rise of temperature for an hour to 103° F. The photograph shows that after a year and a half neither hernia nor depression results. After two years there has been no recurrence. The photograph of the tumor shows it much contracted by long maceration in formalin, after the loss of its softened contents and its skin flaps, and with three ribs extending through it. Its weight was fifteen pounds, and in various places inside it was gelatinous,

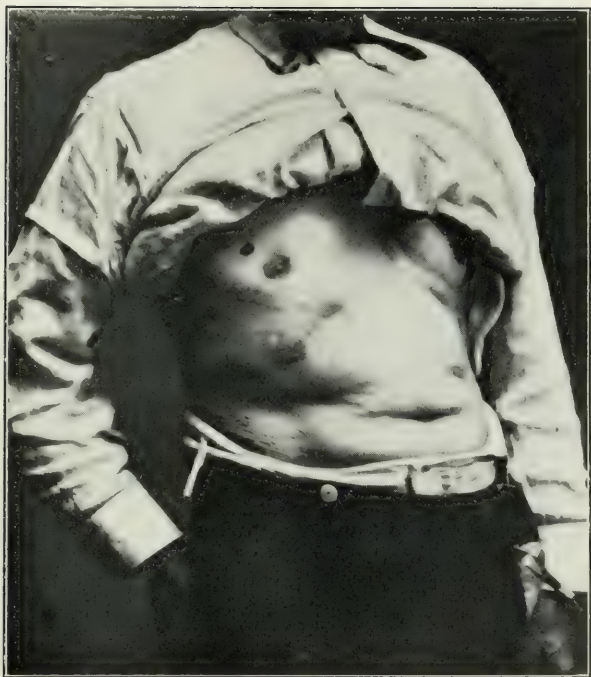


FIG. 1.—Cicatrix left after removal of tumor.



FIG. 2.—Tumor after removal.

presumably from pressure necrosis. Neither these portions nor those of stony cartilage would guide a microscopist to its original nature. Probably an enchondroma with more or less sarcomatous admixture.

The factors here fall partly within and partly without the rules given by Jacobson to guide us in choosing such cases for operation. The tumor should be nodulated and well-defined, of slow growth, moderate size, involving not more than parts of four ribs, surface hard, the skin not infiltrated, no enlarged glands, and no dulness in the neighborhood of the growth (the last excluding secondary deposits in the lung rather than an intrapleural extension of the tumor). Considerable search shows the following successful case by Zarübin, of Kharkov, to be the nearest approach to the one above described.

The patient was a young Cossack, and the tumor measured eight and one-half by seven and one-half inches, was larger than the head, and weighed six pounds. The opening in the chest wall was six and three-quarters by six and a half inches. There were some pleural adhesions; otherwise the operation and after-course were quite similar. Zarübin reports ten other cases, six of which were successful.

HEPATIC SYPHILIS FROM A SURGICAL STAND- POINT.¹

BY CHARLES GREENE CUMSTON, M.D.,

OF BOSTON, MASSACHUSETTS.

IN October, 1900, in an address delivered before the Cheshire County Medical Society, it was endeavored to point out the necessity of a closer study by observation and exploratory incision of cases of syphilis of the abdominal viscera, and in that address several instances were reported.

The first case of hepatic syphilis that it has been our lot to operate upon was a gentleman, forty-one years of age, married, and the father of four children, the first two having died at birth, the other two always having been in good health. The antecedents, both personal and hereditary, of the patient were without interest, and he denied ever having contracted syphilis. He was not an alcoholic. About three months before the patient came under observation he had become suddenly jaundiced, and soon after he complained of pain in the right hypochondriac region as well as in the right shoulder-blade. Palpation showed that the border of the liver extended about four fingers'-breadth below the costal margin and extended towards the median line. A slight amount of ascites was present, and the patient had lost some ten pounds in weight since the commencement of his illness. Œdema of the lower extremities was wanting, and there was entire absence of any history pointing to *melæna* or *hæmatemesis*. A detailed examination of the other abdominal and thoracic viscera was negative, and there was complete absence of enlarged lymphatic glands in the various points where they are to be found. A diagnosis of carcinoma of the liver or gall-bladder was made, and an exploratory incision advised.

¹ An address delivered at the annual meeting of the Manchester Medical Society, February 18, 1903.

An incision was made in the semilunar line over the growth, and the enlarged liver was exposed after numerous tough adhesions with the parietal peritoneum had been broken down. The liver felt hard, and two nodules, the size of English walnuts, projected from the anterior surface of the right lobe near its border; their contour was regular and their surface somewhat nodular; in color they were light yellow. There was no evidence of carcinoma, so that an incision was carried across both nodules and a large amount of cheesy material scooped out, leaving two rather clean-cut cuplike cavities in the liver. The cavities were packed with gauze and the abdominal wound closed excepting at the upper angle, which gave exit to the drains. These were removed in four days and the abdominal wound rapidly closed.

Iodide of potassium, at the dose of four grammes daily, was administered, and continued for three months and a half. The jaundice completely disappeared within five weeks of treatment with the iodide, and at the end of three months the liver had resumed its normal size. The patient was under our care over a period of two years, and has remained perfectly well.

Since observing the above case five years ago, my attention has been carefully directed towards syphilitic manifestations in the liver, and two other instances have occurred, the histories of which will be shortly given. On account of the extreme interest in hepatic syphilis from the surgeon's stand-point, I have gone over the literature of the subject with some attention, and have been able to collect a number of instances in which the abdomen was opened after a mistaken or correct diagnosis had been made, and these cases will be briefly referred to; but for a moment I would like to direct attention to a few remarks on the pathology and diagnosis of the late manifestations of this potent virus in the liver.

What strikes one's attention first of all is that gummata of the liver produce the same symptoms as do other neoplasms of this viscus, both functional and physical. Mauriac has said in his excellent writings that tertiary syphilis of the liver, in the gummatous, sclerous, or sclerogummatous forms, slowly and

obscurely progresses, and only reveals its presence when the organ is seriously affected by the process. Now, as a matter of fact, the functional symptoms are often only slightly pronounced. Pain, loss of appetite, diarrhœa, and, later on, ascites with changes in the urine are the clinical phenomena which are nearly always present during the evolution of gummata of the liver, but each of these vary greatly in intensity in one case to another. Usually the patient will complain of a sensation of weight in the region of the liver rather than a real pain. There are periods of increase and disappearance, the first of these usually being accompanied with a slight rise of temperature. In some rare instances, however, pain has been complained of for several months.

Besides the cases in which pain is only of secondary consideration, there are others which are certainly far from infrequent, in which the syphilitic neoplasm is accompanied by an adhesive perihepatitis, in which case the pain will be extremely severe, and is not only complained of in the region of the liver, but in the thorax and back as well. Respiration becomes extremely painful and difficult.

In many cases the patients will complain of weakness of the limbs, loss of strength, and nervous depression. This condition is usually more marked towards night; and, although it is not precisely pathognomonic, it should be always taken into serious consideration when making the diagnosis of a syphilitic lesion. Simon has pointed out that towards night there is a tendency to chills and a marked sensibility to cold, although the patient's skin may be warm and moist, while the pulse is fuller and more frequent.

In the beginning of the process the digestive disturbances are slight, usually amounting to an irregularity in the appetite and some dyspepsia; but as the neoplasm increases in size this condition becomes more marked, and may arrive at such a point that anorexia is complete and the patient shows a decided distaste for all kinds of food. Vomiting may occur, which, according to Lacombe, disappears at the end of the affection, diarrhœa sometimes taking its place, which may be occasionally

accompanied by a melæna. In other cases constipation with intestinal distention is observed.

Ascites appears to be a rather constant symptom, so much so that so great an authority as Fournier says that he has never seen it absent, but Trinkler and others have found it totally absent. Often it is considerable in amount, and the liquid reappears very rapidly, following paracentesis. The ascites may give rise to pseudomembranous deposits on the peritoneum, especially that covering the liver. When the neoplasm arises near the biliary tract, by compression it may produce a marked jaundice, whose evolution will, from the nature of the process, be slow and most persistent. According to many writers on the subject, it causes only slight disturbances. The urine may contain albumen, because renal lesions are often present at the same time.

Among the objective symptoms, the first which usually draws the surgeon's attention is an increase in the size of the region of the liver and the upper part of the abdomen. This is not only due to the size of the growth, but also in some cases to the ascites present. The abdomen will be found to have developed more particularly in its upper part, especially in the right hypochondrium and epigastrium; occasionally it is enlarged in the left hypochondrium. The tumefaction may extend more or less to the umbilical region, and this is more frequently the case when the left lobe of the liver is the seat of the trouble. Oftentimes a peripheral circulation more or less marked is observed in the abdominal wall. If the region of the liver be carefully examined, the patient taking deep inspirations, the tumor may often be seen to follow the movements of the lungs, which are imparted to the liver by means of the diaphragm; but if the neoplasm has contracted adhesions with the surrounding viscera, its mobility will naturally be uninfluenced by respiration. When the tumor has attained a certain size, palpation will often show its size, seat, external shape, its mobility and consistency; but it should be pointed out that the site of the neoplasm varies greatly, according to the lobe involved. Thus, a syphilitic neoplasm of the left lobe may occupy

the epigastrium, and extend well down even to the region of the umbilicus, but usually palpation will demonstrate its connection with the liver.

By palpation the presence of adhesions of the growth with the surrounding viscera may be demonstrated, but the information obtained by palpation may occasionally lead one in error, because a solid neoplasm, on account of its structure, may give rise to the phenomena of fluctuation, and thus may be mistaken for liquid growths. The degree of mobility of neoplasms of the liver is most varied, but usually it is more marked transversely. Sometimes, however, the tumor may be moved up and down, but it is only infrequently that it can be pushed downward.

Percussion will give dulness, which usually extends directly from the growth to the liver, but in some instances a line of sonority was present between the neoplasm and the liver.

From what has been seen, it is evident that the various symptoms are nearly all common to the various neoplasms arising from the liver, and in making a diagnosis of a gumma the past history of the case is the only one that can lead us to the correct conclusion.

Syphilis of the liver is either acquired or hereditary, and it is only during the late tertiary period that gummata make their appearance. They usually do not arise in the liver until five years have elapsed since the date of infection, and more commonly it is from ten to fifteen or even twenty years afterwards that they manifest themselves. They appear in that period of the disease when the patients are afflicted by circumscribed gummata of the skin, exostoses, and ulcerations of the pharynx. In adults the typical tertiary lesion of the liver is the sclerogummatous form. The deep depressions in the anterior border of the organ and the bands of cicatricial tissue which cover and penetrate the hepatic tissue are characteristic of syphilis. Virchow has said that the largest depressions are found in the neighborhood of the suspensory ligament, and that this bossed condition is always more marked on the convex

aspect of the organ. Between these depressions large milky patches are often seen, which signify that inflammation of Glisson's capsule has been present, and especially the white cicatrices from which fibrous tracts start off.

Gummata vary in size from a split pea to a walnut, their form being either quite round or irregular. They may be isolated from each other in the midst of the hepatic parenchyma, or when numerous their arrangement is most variable.

If a section of the liver is made it will be found extremely hard, and the parenchyma of a yellowish hue. Disseminated throughout the organ, more perhaps in its centre than at its surface, yellowish or whitish neoplasms, which occasionally are either of a light or a dark red color, are found.

The gummata are composed of a homogeneous peripheral part, which appears itself to be limited externally by a fibrous shell. Towards the centre caseation will be found to have taken place. Gummata may undergo calcification and become encysted, or they may disappear by fatty metamorphosis or by absorption, in which case they leave star-shaped cicatrices, which have been so well described by Lancereaux.

Microscopically, the most marked lesion is found in the connective tissue which has undergone a hyperplasia, not only of the interlobular connective tissue itself, but everywhere where this tissue is present, both in the interior of the lobules as well as at their periphery, so that there is at the same time a perilobular and an intralobular cirrhosis. These changes show themselves under the form of fibrous bands which radiate in every direction, compressing the lobules, which ultimately give rise to fatty or amyloid degeneration of the cells. By this same compression the small hepatic and portal vessels become compressed, giving rise to a mechanical hinderance to the circulation, which in its turn produces ascites. The lumen of the vessels may even be completely obliterated, on account of the development of cicatricial tissue within their walls. The larger vessels may also become involved in the process, and it has been pointed out by Verflassen that in advanced lesions

of the liver marked changes of the portal and cava veins will be found.

The large vessels, in point of fact, are compressed by the connective tissue, and in certain places their walls will be found to have almost completely disappeared. They are compressed laterally, their lumen being reduced to a small slit, while in other cases the lumen remains large and gaping. This explains why in some cases hæmorrhage during operation has been slight, while in others it has been so severe and difficult to control that the patients have died.

The biliary canals usually escape the process, but occasionally the smaller ones become obliterated by compression from a gumma. Both Virchow and Lancereaux have recorded cases of compression of the larger trunks, either by gummata or by lymph nodes, the compression having given rise to jaundice.

Microscopically, gummata vary according to whether they are of recent date or of long standing. The former, according to Cornil and Ranvier, are formed by small microscopical nodules whose centre has undergone an atrophy and a granular degeneration of the cells, while the round cells found in the periphery become confounded with the neighboring embryonal tissue. The large gummata are simply formed by a large number of these nodules.

In old gummata naked-eye inspection shows three concentric zones,—a central one which is yellow and softened; the middle is more resisting and elastic; while the external one consists of a fibrous shell. The central softened part contains small cell elements packed closely against each other and filled with fine granulations; they are undergoing a granulofatty degeneration. The elastic zone is composed of lacunæ limited by connective tissue and containing larger granulations, while the peripheral zone is composed of very tightly packed connective-tissue fibres imprisoning sclerotic vessels and round or flattened cells. In the large majority of cases an adhesive perihepatitis is present, binding the liver to the diaphragm and the surrounding viscera.

Amyloid disease of the liver is frequent during the progress of tertiary syphilis; the entire viscus becomes involved and is uniformly enlarged. It will be found very hard and smooth and frequently projects quite a distance below the costal border. It is accompanied with symptoms of amyloid disease in other viscera, such as the intestines and kidneys. The treatment is antisiphilitic.

The diagnosis of gummata of the liver is always a matter of extreme difficulty, and, even if the diagnosis of the other neoplasms of the liver appears to be practically certain, it is far from easy to assert the nature of the growth.

As to the differential diagnosis, syphilitic neoplasms of the liver may simulate very closely all the various affections to which this organ is heir. Lancereaux has published a case in which a diagnosis of tubercular peritonitis was first made, and then was changed to that of carcinoma of the liver, and the exact diagnosis was only made after an exostosis of the skull made its appearance. The rapidity in the development of gummata of the liver oftentimes simulates serious carcinomatous disease.

Occasionally a large softened gumma might be taken for an hydatid cyst, and should it be accompanied with fever and symptoms of suppuration, it is easy to understand how difficult the diagnosis would be between a gumma and abscess of the liver. In Lilienthal's case, in which a suppurating gumma of the liver was present, the diagnosis wavered between an affection of the liver and a suppurating cholecystitis.

Tuberculosis of the liver need never enter into serious consideration, because in adults it is extremely rare. It is occasionally met with in children in the form of miliary tubercles, or as small yellowish tumors the size of a pea, which never assume such dimensions as to give rise to a true tumor.

The diagnosis of hydatid cyst might be considered, but the absence of a fluctuating mass, or a smooth, round tumor, would render the diagnosis doubtful until an exploratory aspiration showed an absence of fluid.

An hepatic gumma may be easily mistaken for a carcinoma

of the liver, but it should be recalled to mind that primary malignant disease of this organ is rare, and on the other hand, in cases where the malignant disease invades the liver as a secondary manifestation, the primary growth will be found in some other organ. Besides, the progress of carcinoma is much more rapid than that of gummata, and cachexia is more marked. The advanced stages of syphilitic disease of the liver are difficult to differentiate from carcinoma, especially in subjects well along in years, and when there is much nodulation and general cachexia. It has been asserted that malignant disease is more frequently localized to either the right or left lobe of the organ, at least in the early stages, while syphilis involves both lobes at once; but this, as will be seen by some of the cases reported, seems to be an entirely erroneous conclusion. On the other hand, little help can be derived from this statement, because it is most difficult or even quite impossible to ascertain whether one or both lobes are involved; but I would point out that the presence of an enlarged spleen would be in favor of syphilis, since it is common in this disease and rare in carcinoma.

The jaundice of late syphilis due to hepatic complications usually gives the patient the appearance of strongly marked cachexia; he is either thin, weak, livid, and shrunk, or bloated and flabby. The color of the skin is a deep yellowish brown, as distinguished from the decidedly lighter yellow hue of the jaundice due to functional disturbances or the bile secretion. Hyde and Montgomery observe that there is usually severe headache and often albuminuria, but this seems to be wanting in most of the cases that have been collected in this paper.

We would also mention the differential diagnosis with ulcer of the duodenum, because a few years ago such a case came under our observation, and, as it has some interest pertaining to this subject, we will briefly relate it.

The patient, a well-built, muscular man, of about forty years of age, had complained for a number of months of more or less

severe pain in the region of the gall-bladder. He had been slightly jaundiced for several months. The tongue was furred, the temperature normal, and the pulse averaged about 80. Examination of the abdomen revealed a large, somewhat nodulated mass in the region of the gall-bladder, the border of the liver extending about three fingers'-breadth below the costal margin. A diagnosis of tumor of the liver or some affection of the biliary apparatus was made, and an exploratory laparotomy was done. When the abdomen was opened, a small amount of ascitic fluid escaped. The enlarged liver was seen in the wound, but the region of the gall-bladder, where the tumor had been felt, presented a mass of adhesions of considerable strength. These were broken through, the gall-bladder was found normal in size, and contained no calculi, so a diagnosis of ulcer of the duodenum was made. Owing to the great amount of adhesions present, it was decided not to interfere farther, and the abdomen was closed.

A physician, who had treated the patient some years previously and who was present at the operation, informed us that he had formerly treated the patient for syphilis, and from this knowledge obtained the patient was immediately placed upon large doses of iodide of potassium, which completed the cure of all the symptoms within three months, the tumor disappearing, and the patient returning to perfect health. Over two years after the operation he was still perfectly well.

The only means of absolute value in helping one to assume the diagnosis of gummata of the liver is a previous history of syphilis in the patient; but one should not only look for traces of acquired syphilis, but for those of the hereditary form as well. Fournier especially insists on the point that gummata of the liver occur as frequently in hereditary syphilis as in the acquired form.

We will now report the histories of two more cases of hepatic gummata which have been under our care, making three in all.

The first was a married woman, thirty-nine years of age, who had complained for some time of a dull pain in the right hypochondriac region, and occasional nausea. The patient had in her early married life three miscarriages, but later on had given

birth to two children, who apparently were in perfect health. The patient was somewhat jaundiced at our first examination; the tongue was furred, pulse 76, temperature and respiration normal.

Blood examination gave a slight leucocytosis. Examination of the thoracic viscera was negative, and no enlarged lymph nodes could be detected in the axilla, groin, or supraclavicular region. Palpation of the abdomen revealed a somewhat nodular tumor lying in the epigastric region and nearly reaching to the middle line, and extended about five fingers'-breadth below the tip of the sternum. Both liver and tumor moved with the respiration, and by percussion the growth appeared to be directly connected with the liver.

From the history of the case, the tumor was considered as probably syphilitic in nature, but, as there was some doubt as to the possibility of the disease being malignant, an exploratory incision was advised and accepted.

Several days later the abdomen was opened in the right semi-lunar line. A small amount of ascitic fluid escaped. The tumor was composed of the left lobe, which was studded with numerous tumors varying in size from an almond to a walnut. They were more or less circular in shape. A small superficial one situated near the border of the organ was excised for microscopical examination and the abdomen closed.

As the growth proved microscopically to be a typical gumma, the patient was immediately placed on inunctions of mercurial ointment and iodide of potassium at the dose of four grammes daily. Under this treatment her recovery was remarkably rapid, so that in less than four months all traces of the tumor had disappeared and symptomatically she was well. This case was followed for over three years after the operation, and has remained in good health ever since.

Our third and last case was a male forty-nine years old, a merchant, who had always led a rather irregular life. He was unmarried. He had had three attacks of gonorrhœa, but denied ever having contracted syphilis. For the last year and a half he had been losing weight, so that from 190 pounds he had dropped to 167. He was a well-built man, although he had become quite anæmic. At about the time he began to lose flesh he had noticed a fulness in the upper part of his abdomen, but had paid little attention to it, as it gave rise to no pain. He had

never had, as far as could be ascertained, any serious sickness excepting pneumonia at the age of twenty.

When first coming under observation in September, 1901, the fulness in the upper part of the abdomen had begun to produce a certain amount of hinderance to the respiration, and added to this discomfort the patient was complaining of digestive disturbances, consisting in anorexia, slight nausea, and eructations of gas. The temperature was normal and the pulse 82.

On examination, the heart and lungs were found to be normal, the urine containing a trace of albumen, but no casts.

Percussion showed that the liver-dulness extended to about three fingers'-breadth below the costal border, and from there towards the epigastrium and downward to within three fingers'-breadth of the umbilicus. By palpation an ill-defined mass could be made out in this region; its surface was irregular, and it was somewhat painful when pressure was used. It appeared to be connected with the liver, and was fairly movable transversely, but it could not be pushed either upward or downward.

From the history of the case, and from the condition found by examination, a malignant tumor was suspected and an exploratory operation advised and accepted.

An incision was carried along the external border of the right rectus muscle, and when the abdomen was opened the tumor was found adherent to the peritoneum. By careful manipulation the adhesions were broken down, when it was found that the tumor sprang from the under surface of the left lobe of the liver, and was connected to the organ by a pedicle, the diameter of which might have been about the size of a quarter of a dollar. A chain ligature of celluloid thread was passed through the pedicle, which was then tied, and the tumor easily removed. There was little oozing from the stump, but it was thought more prudent to insert a small iodoform gauze wick, after which the abdomen was closed. The pedicle of the tumor was four centimetres long, while the growth itself was very much the size and shape of an orange.

Microscopical examination showed that we had removed a pedunculated gumma of the liver. Several similar cases have already been reported, and there is one that I know of by Mr. Mayo Robson, but, unfortunately, it has been impossible to find the reference to this case in the literature.

In the *Traité de Chirurgie*, edited by Duplay and Reclus, Second in his article is decidedly against surgical interference in syphilitic growths of the liver. I cannot, however, agree on this point with my distinguished friend; but it is certainly proper that when once a diagnosis of syphilis of the liver has been made with any degree of certainty, an antisyphilitic treatment should be exhibited and persevered in for a considerable lapse of time. Mercury in the form of inunctions, and the iodide of potassium internally, should be given in sufficiently large doses in order to judge of their efficacy, and by sufficient doses we mean that one gramme of the ointment, and at least three to four grammes of the iodide should be taken daily. When this treatment remains unsuccessful, even if we are in the presence of a gummatous liver, it is because the gummata are so old and the tissues have become so changed that medical treatment is without avail, and under these circumstances the question of surgical interference may very properly be considered. It is hardly necessary to say that not all gummatous tumors of the liver which have resisted all treatment can be removed by operation, because, in order to be able to extirpate them, the tumor must form a single mass, and numerous deposits scattered here and there in the liver substance would render it impossible to remove them all. Besides this, the location of the tumor in an accessible point is necessary, that is to say, either in the left lobe or on the convexity of the right lobe; but even here this rule cannot always apply. Bastianelli was able to extirpate a gumma arising in the under surface of the liver, and Lauenstein removed one from Spiegel's lobe.

What is particularly essential is that the tumor be not profoundly situated in the hepatic parenchyma, because in this case its removal would necessitate such a destruction of the organ that the patient's life might be in danger. But in those cases where the gumma is only covered by a thin layer of parenchyma, resection is without danger and relatively an easy matter. In cases of pedunculated gumma the operation is fairly easy when the growth has sprung from the under surface of the liver, for little or no injury is done to the hepatic tissue, and con-

sequently with a good ligature there is practically no danger of hæmorrhage. The size of the tumor makes little difference regarding its removal, provided it is easily accessible. The presence of dense adhesions is a matter which can only be considered in each given case; but if the operation be carefully conducted, it would seem that, other than rendering it much more tedious, the presence of adhesions will not materially interfere with the removal of the growth in the large majority of cases.

In some cases a complete extirpation of the tumor will be found impossible, when, for example, it is more or less diffused, and sends off tracts of neoplastic tissue into the hepatic parenchyma.

To discuss the technique of removing tumors of the liver would carry me far beyond the intended limits of this address; as they are so well known, I shall leave them entirely aside, and in closing I would say that when an abdominal tumor is discovered in a given case, happy should be the patient if he has had syphilis.

CHRONIC INTERLOBULAR PANCREATITIS.

REPORT OF A CASE OF PANCREATIC CALCULI, WITH MULTIPLE CYSTS OF THE PANCREAS.

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THE patient, Mrs. K. S., thirty years old, first entered St. Luke's Hospital, March 22, 1902, under the care of Dr. Clarke J. Burnham, giving the following history:

Her mother and one sister had died of pulmonary tuberculosis. She herself had been delicate since childhood. Rheumatism at nine; miscarriage at seventeen; pneumonia at twenty; metritis and oophoritis at twenty-two. Previous to one year ago she had been a drinker of alcoholic stimulants; since then she has not touched liquor at all. Her present illness dates back nearly one year. For the first two or three months she complained of feeling badly,—troubled with nausea, indigestion, and general malaise. Then, nine months ago, she suffered from an attack of jaundice lasting about one week. After this she suffered some from indigestion. Five months ago she had an attack of severe, griping, paroxysmal pains in the epigastrium lasting for several days. One month afterwards she had a similar attack, but added to her epigastric pain she began to have a severe, dull, heavy pain in both lumbar regions. This was ushered in by a chill followed by fever, accompanied by frequent micturition; but very little urine was voided. From this time on she suffered from attacks about every two weeks. The pain left the epigastric area and centred in the lumbar regions, principally on the right side, and gradually extended down towards the pelvis. Patient had pain in the right shoulder all the time, increased during the attacks of pain below the diaphragm. For the last four months the stools have been clay colored at times. She has lost fifty pounds in weight during the last year. She has also suffered from hæmorrhoids for the past year, and on the day of admission to the hospital she passed

¹ Read before a meeting of the Academy of Medicine, San Francisco, February 24, 1903.

a large clot of blood while straining at stool. Anorexia has been present all the time. She has never noticed any blood in the urine, nor excessive amounts of urine after attacks of pain. No history of passing gall or renal calculi.

Examination on Admission.—Pulse, 80; respiration, 20; temperature, 98° F. Fairly well nourished, rather anæmic. Skin, sallow; conjunctivæ, slightly yellow; tongue, coated. Nothing unusual in lungs, heart, or thoracic wall.

Abdomen; Inspection.—Some fulness in right upper quadrant.

Palpation.—Right rectus very rigid. Two very painful points found on superficial and deep pressure,—one in the epigastrium just to the right of the median line opposite the sixth interspace, the other directly over the gall-bladder. The edge of the liver could be felt one inch below the costal margins, hard and slightly tender. Extending from the tenth rib towards the umbilicus, beneath a very tender area, a decided sense of resistance was felt as of a mass, although, on account of the muscular rigidity and tenderness, it was not possible to diagnose a tumor from palpation alone. Palpation of the kidneys and pelvic viscera was negative.

Percussion.—Liver-dulness enlarged downward about one inch below free border on right side. Dulness continuous with the liver-dulness extended across the epigastrium to the left side opposite the sixth interspace over the painful epigastric area. This dulness also extended from the gall-bladder region, triangular-shaped, with the apex about one and one-half inches from the umbilicus. Elsewhere the abdomen was moderately tympanitic.

Auscultation developed nothing new.

Urine.—Amber, acid, 1018, no sugar; slight traces of albumen and bile. Microscopically, it showed calcium oxalate crystals, pus-cells, granular casts, few red cells.

Stools.—No free fat found. They were clay colored, however.

Blood.—Hæmoglobin, 75 per cent.; reds, 3,600,000; whites, 9200. Differential count; large mononuclear, 8 per cent; small lymphocytes, 21 per cent; eosinophiles, 4 per cent.; neutrophiles, 67 per cent.

During her first stay in the hospital her temperature was never higher than 99.6° F., and usually was normal. Her pulse varied

between 70 and 90. She was put upon a liquid diet, given potassium iodide thrice daily in increasing doses for three weeks; Carlsbad salts, one drachm every morning; unguentum hydrargyri over the liver. As her bowels moved more frequently the color of the movements changed from white to dark brown, and the tumor in the region of the gall-bladder disappeared. With it left the yellow of the conjunctivæ and the bile from the urine. As the urine increased from twenty ounces to one hundred and six ounces, the pus in it diminished, though never disappeared. Red blood-cells were no longer found, nor were casts. Sugar was never found in her urine at this time. During her stay she had a very severe attack of pain in the left hypochondrium. She suffered considerably from night sweats, which gradually improved. On leaving the hospital, May 1, 1902, the tenderness over the liver and the area of gall-bladder enlargement had entirely disappeared. The digestion was better, and the patient seemed on the road to a slow but sure recovery.

After leaving the hospital, the patient was better until August. In August, September, and October she again had attacks similar to those described above. In August, a tumor was to be felt in the right epigastrium; in September, it could not be felt, but the abdomen was very tender over this area. In this month very great tenderness developed over the left kidney. In the October attack, about two weeks before re-entering the hospital, and three and a half before death, she passed large quantities of urine, in which sugar was for the first time discovered, amounting to $2\frac{1}{2}$ per cent., and within four days disappearing entirely. She was now having constant pain in the epigastrium, distress after eating, high fever during the attacks of pain, with almost constant night sweats, and a steady loss in weight.

October 28, 1902. Readmitted to hospital for observation and treatment. Patient had been rapidly losing weight, so that her general appearance was one of great emaciation. Pulse, 80; respiration, 20; temperature, 100.8° F.

4 P.M. Pulse, 80; respiration, 20; temperature, 102° F. Bowel movements now yellow; had not been clay-colored for some months. Stools contain bile. Not examined for fat until after the operation, when small amounts were found.

Urine.—Forty to ninety ounces, acid, 1020, no sugar. Trace of albumen; no casts; considerable pus.

She was very emaciated and anæmic; no jaundice. Lungs, heart, and thorax negative.

There was an area of tenderness and rigidity over right upper quadrant of the abdomen, mostly in the epigastric half, just to the right of the median line. No dulness in the sides. Moderate tympany over the rest of the abdomen. Liver-dulness to free margin of ribs. No enlarged splenic dulness.

She complained of constant pain over the area of epigastric dulness. She had exacerbations of pain in the right side, and after her admission she had a very severe attack of pain develop in the left side anteriorly, when the muscles there were so rigid and this area so tender that a pyonephrosis with a perinephritic abscess was thought to be present in addition to the epigastric trouble. These lumbar pains were always relieved for a time by hot applications.

No tumor could be felt in the epigastrium on account of the extreme rigidity of the abdominal walls; but there was a distinct increase of tension over the most tender area,—a space the size of a dollar just to the right of the median line half-way between the xiphoid cartilage and the umbilicus. The constant pain over this area became a thing of minor importance to her during the attacks of pain in the lumbar regions, particularly the left.

Her digestive system was very much upset. She vomited at the least provocation. There was a tendency to diarrhœa, with blood in the stools.

Course in the Hospital.—After a day her temperature came to normal; pulse always between 70 and 80; leucocyte count on admission, 22,200, dropping to 13,400 in forty-eight hours. Stomach remained upset, and she did not gain; had considerable sweating at night.

On November 3 the pulse rose from 70 to 90. Temperature from normal to 101.8° F. The leucocytes rose to 26,000, and, as she was decidedly losing ground, an exploratory laparotomy was decided upon for a possible chance of relief. At the time of operation, we recognized that there were two distinct conditions with which we had to deal,—one, a suppurative condition of the kidneys probably tubercular, involving both organs in all likelihood; the other, some lesion involving the digestive apparatus,—stomach, liver, gall-bladder, or pancreas. Though no very posi-

tive diagnosis was made, an exploratory laparotomy was thought to be indicated.

On November 4, 1902, we performed a laparotomy, incising over the area of epigastric tenderness just to the right of the median line. Two cysts of the pancreas were opened,—one, the size of an orange, presenting between the lesser curvature of the stomach and the left lobe of the liver, in which two stones were found; the other the size of a walnut, behind the first one, and apparently having no connection with it. They were both aspirated, drained, and packed, the posterior one through the anterior, which was in turn sutured to the abdominal wall. The patient was returned to her bed as soon as possible. She grew continually and rapidly worse after the operation. She was able to retain but little in her stomach, and her bowels moved continuously, so that it became impossible to nourish her; she passed but little urine during the first few days, and died on the fifth day after operation without signs of peritonitis, but with her former symptoms exaggerated. There was but little discharge from the cysts, and the skin about the wound was not irritated. The fluid removed from the cysts contained no pancreatic ferments and was sterile. The stones contained calcium salts.

Autopsy.—This had to be done through the wound and hastily. There was no evidence of peritonitis or leakage. No fat digestion in mesentery or surroundings. The pancreas, with its cysts, the gall-bladder, cystic, common, and portion of the hepatic ducts, with pyloric end of stomach and about four inches of the duodenum were removed in mass. The autopsy developed the fact that there was no left kidney, so that all her intense pain in the left lumbar region was most probably from the calculi in the pancreas, a symptom given by some as differentiating pancreatic from choledochous calculi. The right kidney was half again as large as normal, and contained numerous abscesses the size of chestnuts in its cortex. The specimen removed showed the cystic, hepatic, and common ducts patent. The gall-bladder walls were slightly thickened, but no calculi were found in the bladder. The pancreas was greatly atrophied and calcareous particles were found throughout its duct. At the orifice of Wirsung's duct was a stone the size of a small marble, which almost entirely obstructed its lumen, and at the same time partially filled the opening from the duct into a third cyst the size of a walnut, not felt

at the time of operation because it was not under tension, as the opening was still patent. The other cysts were entirely separated from the duct, at the nearest point by only one-eighth of an inch. These conditions were interesting as showing the history of some cyst formations. The large one anteriorly, opened at the time of operation, in which two stones were found, had evidently been produced by the stones in the duct; the stones passing through into it, and finally the cyst closing behind them. It was a cyst of long formation, as no digestive ferments were found in it. The early jaundice was produced either by a preliminary swelling in the head of the pancreas as the common duct passed directly through it; or, the passing of a pancreatic stone into the ampulla of Vater; or, thirdly, by a biliary stone in the common duct which had made its exit into the intestine. This last supposition is quite improbable, as there were no other stones in the gall-bladder or evidence of any having passed through its duct either in the history or autopsy findings.

The microscopical report, for which I am indebted to Dr. Mary Halton, Pathologist of St. Luke's Hospital, shows an advanced stage of interlobular pancreatitis with the islands of Langerhans still well preserved, verifying Opie's observations that in this type the appearance of sugar in the urine occurs only at the very last stages of the disease.

TUBERCULOSIS OF THE FEMORAL, INGUINAL, AND ILIAC LYMPH NODES SECOND- ARY TO FOOT WOUNDS.¹

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TUBERCULOSIS of the femoral, inguinal, or iliac lymph nodes is relatively uncommon. Wohlgemuth, Noorden, Poisson, and Balman, who have together given the location of tubercular lymph nodes in more than 700 cases, which they have analyzed, give the percentages of inguinal involvement respectively as $\frac{9}{10}$ of one per cent., 1 per cent., no per cent., and 5 per cent., making no separate mention of femoral or iliac nodes.²

The entrance of tubercle bacilli into the system through wounds in the skin is also a rare occurrence. The bacilli ordinarily gain entrance into the system through the respiratory tract, and the danger of inhaling dust which may contain them is very generally understood. They do not, however, often find their way into an open wound; tubercular wound infection is so uncommon as to be considered among the surgical curiosities.

Yet within four years nine cases of tubercular femoral and inguinal lymph nodes have been admitted to St. Mary's Free Hospital for Children, 15.8 per cent. of the entire number of patients with tubercular lymph nodes who were admitted to the hospital during that time; in eight of them inflammation of the iliac nodes is also recorded, and it is believed that it existed in the ninth. In all but two of the cases there is good evidence that the infection was received from foot wounds, and there is little doubt that it was so received in these two.

The following record illustrates the appearance and course of the inflammation in the most virulent case of the series.

¹ Read before the New York Surgical Society, January 28, 1903.

² "Krankheiten der Lymphgefäße, Lymphdrüse und Blutgefäße," Dr. Friedrich Fischer, Deutsche Chirurgie, Lieferung 24a.

J. K., a well-nourished, otherwise healthy boy of six years, was admitted to the hospital on September 27, 1898, having cut his foot about a month previously, and having a bunch of enlarged lymph nodes just below Poupart's ligament on the same side. The foot wound had healed. The boy had a temperature of 102° F.; the nodes were acutely inflamed, and were removed on the following day. They were found to be about the size of large hickory nuts, of uniform soft consistence, without visible necrotic or caseous spots. They were considered to be simple hyperplastic lymph nodes infected from the foot wound, and the incision was expected to heal promptly. Such healing, however, did not follow; two weeks after the first operation there was a marked enlargement of the inguinal nodes, and the boy had a temperature of 104° F. These nodes were therefore removed through an incision above Poupart's ligament. They presented the same gross appearance as the others,—the size of large hickory nuts, on section rather soft and of a uniform pinkish color, with no visible caseous or necrotic spots,—the typical appearance of hyperplastic enlargement; on microscopical examination, however, they were found to be tubercular.

For the next seven weeks there was a slight purulent discharge, the temperature ranging from about 99.5° to about 100.5° F.; more enlarged nodes could then be felt on pressing deeply into the pelvis over Poupart's ligament, and on December 2 another operation was done:

An incision was made above Poupart's ligament from the anterior superior iliac spine to the pubic crest, the peritoneum was retracted upward, and several nodes were dissected from within the pelvis along the iliac vessels. On May 19, the discharge still continuing, a little tubercle tissue and a few more nodes were removed through a similar incision. At about this time he also showed evidences of spinal tuberculosis in the middle dorsal region, for which he was treated with a spinal brace. He was under observation until October 7, 1899, spending the summer at the summer branch of the hospital at Norwalk, Connecticut. At that time there was still a very slight discharge from the inguinal wound, but his general condition was good; his spine was doing well. He was seen again six months later; the sinus was then healed, but the spinal caries was progressing. Soon after that he contracted diphtheria, from which he died.

The infection in this case was most virulent. It progressed steadily within eight months from foot wound to dorsal spine, although four attempts were made to check it in its course through the lymphatics, all palpable nodes being removed each time. The infection of a bone was contrary to the general law in lymphatic infection and may be considered an exception.

Instead of narrating the details of the other histories in turn, I will group those subjects which seem of the greatest interest.

THE CHARACTER OF THE SKIN WOUNDS.

CASE I.—Sluggish ulcer over tendo Achillis, one-half inch in diameter. Excised and found to contain tubercle tissue.

CASE II.—Wound in sole of foot two months ago, which became infected, and subsided very slowly under treatment. Entirely healed when patient came to hospital.

CASE III.—Slight wound in sole of foot two months ago. Child goes about barefoot; mother had bad cough; she dressed wound, which healed in about four weeks. A similar second wound formed three and one-half weeks before admission to hospital.

CASE IV.—Five months ago he stepped on a rake and cut his foot. The wound healed under treatment, but opened again two months ago. Since then it has alternately healed and broken open. (Now healed.)

CASE V.—No statement as to foot wound.

CASE VI.—No statement as to foot wound.

CASE VII.—Had a slowly healing sore on foot about a month ago.

CASE VIII.—When admitted there was a sluggish ulcer on inner surface of ankle, one-half inch in diameter. Its duration was not known.

CASE IX.—Cut foot in a swamp eight months previously. The wound had alternately healed and opened during that time. When admitted to hospital it looked like a spot of lupus.

Thus in all the cases but two there are distinct histories of sluggish foot wounds.

In one instance this ulcer was excised and found to be

tubercular. In another it was not excised until it had been curetted, and then no tubercle tissue was found.

In six instances the wounds were healed when the patients came to the hospital.

In one there was a sluggish ulcer, which healed in the hospital.

CONDITIONS PREDISPOSING TO TUBERCULAR INFECTION OF WOUND.

In only two instances was there anything about the family history of the patients which indicated the source of the infection. In one of these the father had phthisis; in the other the mother had a chronic cough, "worse of late," and she dressed the foot.

All the children were accustomed to go barefoot, and all lived in tenement houses.

THE GENERAL COURSE OF THE DISEASE.

In this there were few variations, excepting that some infections were more sluggish and persistent than others, and some patients suffered from other complicating diseases.

The duration of the primary sore on the foot varied from less than one month to about eight months.

The femoral lymph nodes about Scarpa's triangle were regularly the first ones to become noticeably enlarged; then the infection of the inguinal nodes above Poupart's ligament followed, and then the nodes within the pelvis along the external iliac vessels.

In one instance the popliteal nodes were also noticeably involved in the inflammation, breaking down and forming an abscess.

The process is slow and tiresome. In all but one case, although the wounds showed no operative infection, there were sluggish sinuses or granulating areas which only healed after long periods of treatment, carried on in some instances outside the hospital, and in one instance the child came back, several months after first leaving the hospital, on account of

a persistent sinus in the popliteal region. Another patient had a most persistent vesicular and bullous dermatitis as a complication. Other patients had measles and diphtheria.

The length of time for which the patients were under observation was as follows: 54, 23, 61, 244, 88, 119, 365, 124, and 410 days.

An average of 165.3 days.

The long duration of the illness of the last patient was due to the sluggish popliteal sinus.

PROGNOSIS.

The prognosis is apparently good. The local inflammation was healed in every case but two when the patients were last seen, and in these instances only small granulating sores remained, which were healing satisfactorily. In only one instance was there evidence of tuberculosis in other parts of the body; that one whose history has already been given in detail had dorsal Pott's disease.

Three of the patients were seen respectively eleven, fourteen, and eighteen months after leaving the hospital, and were in vigorous health.

One patient died of diphtheria.

The remaining five patients had moved and could not be traced.

None of the patients showed swelling of the leg or other ill effects from the removal of the lymphatics.

TREATMENT.

The study of this group of cases leads one to bear in mind the possibility that enlarged femoral lymph nodes may be tubercular, and as soon as the diagnosis is made to advocate the removal of the nodes from the femoral, inguinal, and iliac regions.

In four of the cases this thorough removal was done at once, and for them the average duration of treatment was sixty-four and one-quarter days.

In four others only the femoral nodes were removed at the first operation, and in a fifth only the femoral and inguinal; the average duration of treatment for these cases was 246 days, or, if we deduct the prolongation of the treatment, which was due to complications, it was still more than twice as long as in other cases. A secondary operation and removal of the nodes within the pelvis was necessary in every instance but one, and in that one it probably would have been advantageous.

METHOD OF OPERATION.

For the removal of these three groups of nodes, a vertical incision is begun below the apex of Scarpa's triangle and carried just above Poupart's ligament, where it is joined by a transverse incision which extends from the anterior superior iliac spine to the crest of the pubic bone. The femoral nodes can be removed through the vertical incision, and after the inguinal nodes have been removed through the transverse incision, the aponeurosis of the external oblique may be divided just above Poupart's ligament. The fibres of the internal oblique and transversalis muscles and the transversalis fascia may be drawn up as in the operation for ligation of the external iliac artery, and their attachments divided as far as the ends of the incision, and access gained to the iliac fossa, so that the greater part of the external iliac vessels can be explored and the accompanying lymph nodes removed.

In these cases this seemed sufficient, as the examining finger could detect no nodes beyond those which were removed.

Lennander (*Centralblatt für Chirurgie*, 1899, No. 37), however, advocates a more extensive operation. Externally, his incision is carried over the outer third or outer half of the iliac crest, and at the inner end of the incision Poupart's ligament is divided from the pubic crest. This permits exposure of the pelvic and retroperitoneal nodes as far as the middle of the common iliac artery, or even to the bifurcation of the aorta. I see no reason why this should not be done in suitable cases; but for all those which have come to my notice, it has not seemed best to weaken the inner attachment of Poupart's liga-

ment or the aponeurotic attachments at the crest of the ilium by this extensive incision. I should, however, practise it on finding a case in which it seemed necessary in order to remove the nodes.

CONDENSED HISTORIES OF THE CASES.

CASE I.—F. N., aged two and one-half years; history No. 12, Vol. v. Admitted May 26, 1900. There was a granulating sore on the left heel half an inch in diameter, duration unknown. Two weeks ago painful swelling in left groin.

Now. In left femoral and inguinal regions mass of lymph nodes size of child's fist. Fluctuation at lower part of mass.

Operation, June 11, 1900. Nodes removed from femoral, iliac, and inguinal regions, size of hickory nuts and filberts. One large and several small ones removed from within the pelvis. Small drain. August 3, discharged at brother's request. Wound nearly healed. Pathological report: Ulcer over tendo Achillis showed tubercle tissue. Lymph nodes tubercular.

CASE II.—F. W., aged nine years; history No. 5, Book v. Admitted September 20, 1900. Two months ago received wound on sole of right foot. Wound was infected and femoral adenitis followed, which has persisted to the present time.

Now. Femoral lymph nodes enlarged just below Poupart's ligament; mass, three by one inches; skin not attached. Moderate tenderness. Wound on foot healed.

September 21, nodes from femoral, inguinal, and iliac regions removed, varying in size from hickory nuts to beans. October 7, wound healed. Pathological report: Tuberculosis with necrotic areas in the largest femoral nodes. The iliac nodes were enlarged, but did not show tuberculosis.

CASE III.—R. H., aged five years; history No. 329, Vol. ix. Admitted October 2, 1901. Two months ago received slight wound on sole of foot. Wound was very slow to heal; discharged four weeks. Five weeks ago mother noticed large lump in right groin. Lump increased in size slowly and became very painful. Three and a half weeks ago received second wound on foot; character same as first. The foot wounds were dressed by mother, who had a bad cough.

Now. Suppurative femoral lymph nodes, small ulcer on sole of foot.

October 4, femoral lymph nodes removed. Size of mass, two and one-half by one and one-half inches. One small superficial node resting on the mass had necrotic areas. There were many other nodes in the inguinal and iliac regions. The others were of uniform consistency, soft, without necrotic areas. Five or six were removed from within the pelvis, the largest about the size of a filbert. Small drain. December 4, discharged cured. Pathological report: Tuberculosis of lymph nodes. No examination of tissue from foot wound was made.

CASE IV.—H. S., history No. 36, Vol. i. Admitted February 1, 1898. Five months ago he stepped on a rake and cut his foot. Wound was sluggish, healing under treatment, but opened again two months ago. Since then it has alternately healed and broken open. It is now healed. An abscess formed below Poupart's ligament, which was opened about two months ago in another hospital. The wound was sutured, but broke down, and has been granulating ever since.

Now. Granulating wound just below Poupart's ligament, sluggish appearance, induration of lymph nodes about it. Child developed measles, was transferred to Willard Parker Hospital. Soon after return, bullous and vesicular dermatitis (probably due to potassium iodide), which persisted until about April 15. April 25, excision of femoral and inguinal nodes, and curetting. July 9, similar operation repeated. September 30, discharged cured.

CASE V.—J. R., aged seven years; history No. 7, Book v. Admitted September 6, 1899. For eight weeks has had painful swelling just below Poupart's ligament, which was opened at another hospital, where it has been treated for six weeks.

Now. Mass of broken-down lymph nodes just below Poupart's ligament on the right side.

Operation, September 6. Nodes removed and sinus curetted. November 3, nodes have appeared above Poupart's ligament, and are removed from inguinal and iliac regions. One node from within the pelvis was the size of a filbert. Small drain. November 27, wound healed. December 2, discharged cured. Pathological report: Tubercular lymph nodes.

CASE VI.—W. C., aged two years; history No. 9, Book v. Admitted June 4, 1900. Last August, a swelling appeared just below Poupart's ligament on left side. In a short time abscess formed, opened, and has discharged ever since.

Now. In left femoral region mass of nodes size of child's fist. There is a discharging sinus on the inner side of the thigh, three inches below the mass.

June 6, mass of nodes removed from femoral region. Incision carried above Poupart's ligament and several similar nodes removed from inguinal and iliac regions. Those within the pelvis were smaller and less advanced in inflammation than the femoral nodes. Small drain. June 15, nearly healed. July 18, sent to summer branch of hospital at Norwalk. October 1, returned from Norwalk in good condition, with wound healed. Discharged cured. Seen April 26, 1902. Good scar, no palpable nodes. Child in vigorous health. Pathological report: Tubercular lymph nodes.

CASE VII.—J. K., No. 6, Vol v. History given in the text.

CASE VIII.—J. G., aged four years; history No. 359, Vol. x. Admitted August 31, 1901. A few days ago a swelling appeared in the region of Scarpa's triangle, which has been accompanied by acute pain. There is an ulcer, half an inch in diameter, on the inner surface of the right ankle. Its duration is not known.

Now. Healthy looking boy. There is a mass about two by one inches below the middle of Poupart's ligament, which is red, hot, and painful. The ulcer on the ankle shows sluggish granulations.

Operation, September 13, 1901. Three lymph nodes removed from below Poupart's ligament, about the size of hickory nuts, and a number of small ones, ulcer curetted. October 18, second operation. Incision above Poupart's ligament, and four similar large nodes were removed from within the pelvis, the largest, three-fourths inch by one inch. The consistency was soft, the surface was slightly mottled. Remains of the ulcer were excised. January 5, 1902, discharged improved, with a very small granulating area. December 7, 1902, in vigorous health. No evidence of enlarged lymph nodes. Pathological report: Lymph nodes showed tubercle tissue. Curetting from ulcer not examined. Cicatricial tissue of ulcer which was excised showed no tubercular tissue.

CASE IX.—W. F., aged eight years; history No. 10, Vol. v. Admitted April 13, 1899. Last August cut his left foot. The wound would nearly heal and then break down again, and after a time a swelling appeared in left femoral region and another in front of the leg, near the foot.

Now. Child appears fairly healthy. There is a lupus-like spot on the sole of the foot. An abscess is pointing on the inner side of the leg at the junction of the upper and middle thirds. There are several large lymph nodes in the femoral and inguinal regions.

Operation, April 14. Curetting of the sole of the foot. Incision of abscess over the tibia. Many femoral and inguinal lymph nodes were removed. June 30, nodes were removed from the pelvis above Poupart's ligament. Sinus in leg curetted. August 15, sent to summer branch at Norwalk. October 7, returned to New York in good condition, but with a small sinus still persisting in leg. Discharged improved. December 13, readmitted. A small abscess over the anterior surface of the tibia. Abscess opened and some nodes removed from popliteal space. Discharged improved April 21. Readmitted May 6, with the wound in leg still discharging. May 28, wound healed. Discharged cured. Seen July 12, 1901. Healthy and vigorous. No evidence of enlarged lymph nodes or any other tubercular inflammation.

CONTRIBUTION TO THE LITERATURE OF OLD IRREDUCIBLE DISLOCATIONS OF THE SHOULDER-JOINT.¹

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CASE I.—One afternoon, in the fall of 1889, a young farm laborer presented himself with a subcoracoid dislocation of the shoulder-joint of three months' duration. He stated that he had fallen from a horse to the ground; on attempting to get up, he had felt an intense pain in the shoulder, and found that he could not move the arm. He sent a messenger for a physician, who, on his arrival, placed him under an anæsthetic, and believed he had accomplished a reduction. He stated that his pain was severe, that the immobility of the arm remained after regaining consciousness, and had continued to the time of his visit to the writer.

On examination, there was presented the usual unmistakable picture of a subcoracoid dislocation. He was placed on the examining table for the purpose of ascertaining the degree of fixation of the humeral head in its false position. While the elbow was being pressed to his side, the arm was gradually rotated outward to its utmost limit, using the forearm as a fulcrum. The head could plainly be seen to move towards the glenoid fossa. Then the elbow was moved forward and towards the median line to a point almost below the nipple; the forearm was suddenly moved from its position of extreme abduction to adduction, and, to our astonishment, the humeral head suddenly assumed its normal position in the glenoid cavity. The arm was fastened by means of a wide roller bandage with the forearm flexed across the chest, and maintained in the position for four weeks, when the case was discharged, with every prospect of acquiring useful function.

In consulting the literature at my command at that time,

¹ Read before the Western Surgical and Gynæcological Association at St. Joseph, Missouri, December 29 and 30, 1902.

several cases were found where reduction had been effected at varying periods of from a few weeks to a year, some by one method some by another, usually, however, after the use of considerable force. The manipulations used in our case, known as the Kocher method, had proved so effective that we were led to hope as much from this procedure as had been realized in recent cases, until a second case presented itself a few months later, a case referred by Dr. H. P. Jensen, of Omaha.

CASE II.—A muscular young laborer who had sustained a subcoracoid dislocation about five months previously. He stated that he had fallen from a height, striking on his right hand while the arm was in an abducted position. Several unsuccessful attempts had been made at a reduction. He carried his arm in an extended position, being utterly unable to flex it. The extremity was swollen, presented a purple color, was very painful, and in the usual subcoracoid position. When first seen he was placed in the recumbent position, but, on attempting to use the Kocher methods, they caused so much pain that further efforts in that direction were abandoned until he was placed under chloroform anæsthesia. All manipulations—extreme abduction, adduction, inward and outward rotation—failed to move the head of the humerus from its subcoracoid position. Prudence seemed to dictate that the utmost limits within bounds of safety had been reached in our manipulative endeavors, so nothing remained to be done but to liberate the humeral head by a free incision. Not being prepared for such an undertaking, and not having the consent of the patient, he was allowed to recover from his anæsthesia, and at a later date arrangements were made for an open operation at his home.

Operation.—Dr. H. P. Jensen administered chloroform. Our assistant disappointed us by his non-arrival, so that the writer was obliged to act as his own assistant. After disinfection of the shoulder, an incision was made, beginning over the acromion process and extending five inches downward directly over the empty glenoid cavity and parallel with the deltoid fibres. The glenoid cavity, covered by a thickened and contracted capsule, was exposed. The humeral head rested under the coracoid process. It was impossible to expose it through this incision, so it was continued forward and inward over the shoulder to the cora-

coid process. Now the coracobrachialis and the short head of the biceps came into view in the upper part, and the pectoralis major in the lower part of the wound. The pectoralis major and the subscapularis were nearly separated from their attachment to the humerus, which partly exposed the head. Outward rotation broke the newly-formed costal adhesions, but the head could not be moved towards the glenoid cavity until the coracobrachialis and the short head of the biceps had been divided. The tear in the joint capsule had closed; the capsule itself, having become a fibrous mass, was excised. The humeral head was replaced with some difficulty with the assistance of an elevator and outward traction on the arm, while Dr. Jensen clasped his hands under the patient's armpits and produced counter-traction. The divided muscles were sutured as nearly as possible in their proper position and the wound closed with a tubular drain. Union was complete in ten days. Passive movements were installed at once, and in the course of two months fairly good, passive motion was obtained.

CASE III.—Referred by Dr. J. C. Moore. D. T., a laborer, who had sustained a subcoracoid dislocation two months previous to his admission to the Methodist Episcopal Hospital. It was explained to the patient that an attempt would be made to reduce the dislocation by manipulation, and, if not successful, open operative measures would be instituted at once, to which he agreed. Accordingly, he was placed in deep chloroform narcosis. The Kocher method was tried repeatedly, but failed. The heel-in-axilla procedure and extreme abduction, traction, and counter-traction yielded no better results. But these manipulations had evidently broken up the adhesions, because the head could be moved almost to the margin of the glenoid cavity. An incision, beginning over the acromion process and extending downward five inches, exposed the head of the humerus covered by the subscapularis and pectoralis major. These muscles were divided, the head coming fully into view protruding through its capsular rent, which had firmly contracted. The thickened fibrous capsule was excised. The head, which was unchanged, readily slipped into its place by Kocher manipulation. The wound was closed as in the preceding case. Union in ten days. Passive movements were begun, and, in a month more, fairly good function was obtained.

CASE IV.—E. D., a robust ranchman, came to the Methodist Episcopal Hospital from western Nebraska. His left arm was extended and abducted, swollen, and painful. He had sustained a subcoracoid dislocation four months previously by being thrown from a horse. After he had given his consent to any procedure, his shoulder was disinfected and he was placed under chloroform.

Manipulations by the Kocher method were attempted. The bone had become firmly adhered beneath the coracoid process, so that the movements could affect the bone no more than if osseous union existed. The efforts at outward and inward rotation were increased, when suddenly, with a snap, the humeral head seemed to have been dislodged from its bed of adhesions. The humerus could easily be placed in its normal position, but, on palpation, the *head* of the humerus could still be felt in its former position under the coracoid process. It was now plain that a fracture of the surgical neck had been produced. Now arose the question whether to fix the arm so as to maintain it in as nearly a normal position as possible, or should the capsule and the separated head be removed? The thing most desired by the patient was relief from pain. It was impossible to know whether the separated head was pressing on important nerves. If it could be determined that by leaving the head the arm would be free from pain, there really was no other indication for an incision. Nothing could be gained by extirpating the capsule, since the end of the humerus could easily be held in place. The prospects for a pseudarthrosis were better with the capsule undisturbed. On the contrary, if the capsule were extirpated, the chances of an osseous union were to be reckoned with. It was further recalled that it had been recommended in old irreducible subcoracoid dislocations that the head be severed with a chain-saw and allowed to remain.

It was decided to fix the arm so that the end of the humerus would be held in place, allow the patient to recover from his anæsthesia, and, if the old pain persisted, to extirpate the severed head at some subsequent period. Much to our delight, all pain had disappeared; consequently, the arm was maintained in its corrected position for four weeks, when passive movements were instituted. A pseudarthrosis developed and useful function was obtained.

CASE V.—A. F., aged thirty years, railroad laborer, admitted to St. Joseph's Hospital. As a result of an explosion, he had sus-

tained about six months previously a subcoracoid dislocation of the right shoulder and a fracture of the right femoral neck. Ineffectual attempts at reduction had been made. The head of the humerus could be brought to the glenoid cavity, but immediately returned to its subcoracoid position when the arm was released. Accordingly, his physician, who is an excellent surgeon, made an incision over the shoulder and through the deltoid, and found that the rent in the capsule was contracted to such a degree that it prevented the head from being drawn through it. The rent was enlarged, permitting complete reduction. The wound was closed and united *per primam*. The arm was fixed in the usual way. The case did well apparently for two or more weeks, when the humeral head gradually passed from the glenoid cavity to its former coracoid position. In this condition he was sent to St. Joseph's Hospital.

On examination, the upper end of the humerus was found as before described, and there was a firm, smooth cicatrix over the outer aspect of the shoulder. The fracture in the right femoral neck had not united.

Operation.—Several days after his admission an incision was made, beginning at a point over the site of the coracoid process (which could be felt), and extending outward to a point over the middle part of the glenoid cavity and then downward for five inches. After turning down this flap and partly dividing the pectoralis major, the exploring finger came in contact with a fragment of bone, which proved to be the fractured coracoid process. This fragment was separated from its attachments and removed. The greatly thickened capsule was then clipped away. The head of the bone, the cartilage of which was eroded, was brought towards the glenoid cavity by means of traction, rotation, and the assistance of an elevator. It was found that the head could not be brought into the glenoid cavity because of muscular shortening, which made it rest against the acromion process. The head was removed with a chain-saw. The end of the humerus now rested in the glenoid cavity. The wound was closed and a tubular drain inserted in the lower end of the incision. The wound healed throughout, except at the point of drainage, where an infection of moderate degree took place. The functional result was fairly good. He was also provided with an ambulatory traction splint for his hip-joint.

CASE VI.—W. M., aged fifty years, ranchman, admitted to the Presbyterian Hospital. He stated that about four months previously he had fallen and “put his shoulder out.” Ineffectual attempts at reduction had been made, the attendant finally stating that the bone was in place. But when the swelling had disappeared, it became evident to him that his shoulder was not right.

On examination, the arm was found to be extended, painful, swollen, œdematous, and could not be flexed. The head of the humerus was found in the subcoracoid position. The following day, under chloroform anæsthesia, by manipulation the head could be transposed to the anterior margin of the glenoid cavity, but no farther.

An incision in the pectorodeltoid interval was made, the cephalic vein encountered and pulled outward and backward, the pectoralis major almost completely severed, and the capsule extirpated with great difficulty. The subscapularis, the infra- and supraspinatus, teres major and minor were divided. Efforts at reduction seemed to be opposed by both the long and short heads of the biceps, which were both divided. The head was then, after several ineffectual attempts, elevated to its proper place; the tendons and muscles were reunited with catgut and the wound closed. Union *per primam*. At the present time the articular movements are still limited, but, on account of the free mobility of the scapula, he is able to perform manual labor.

CASE VII.—Mrs. M. P., aged fifty years, farmer's wife, was admitted to the Methodist Episcopal Hospital. She stated that three years before she had been thrown from a wagon, falling on her shoulder. The medical attendant diagnosed a sprain. She was unable to move the arm at the shoulder, and had not done so since the accident. The arm was semiflexed at the elbow. The shoulder and arm were atrophied, the forearm œdematous and swollen. There had been constant pain, requiring the daily use of morphine for the entire period of three years.

On examination, the head of the humerus was resting on the anterior margin of the glenoid fossa. On movement, the scapula followed every excursion of the arm, indicating probably bony union. The patient came with the urgent request for immediate amputation. Preparations were made, and the patient placed under chloroform the following day. Manipulations now demon-

strated positively that bony ankylosis existed and could not be broken up.

An incision over the head of the humerus and a blunt separation of all the soft parts revealed that we had to deal with an old subluxation, complicated with an impacted fracture of the head of the humerus and a separation of the anterior margin of the glenoid cavity. The real nature of the injury not having been recognized, the bones became firmly united in this position. The head of the bone was removed with a chisel immediately below the lesser tuberosity. The glenoid fossa was freed of its capsule, the end of the resected bone placed against it, and the wound closed. It healed without complications. The pain all disappeared, and from last accounts had not returned.

Seven cases are not enough to draw general conclusions from. While, in a general way, they were all alike, yet in their details there were no two the same. In each one there were conditions unlike those of all the others; so we must consider them in the light of a contribution to a subject that is large. No one surgeon can have a large experience in old irreducible shoulder-joint dislocations; so each one of us must contribute his mite in order that the surgical statistician may formulate general rules for our guidance.

The first question to take into account is, What are the obstacles in the way of reduction? Charles Nélaton, who considered this subject at some length (in the *Archives Générales de Médecine*, October, 1888), arrived at the following conclusions: "(1) That the principal obstacle in the reduction is the retraction of the disused capsule; (2) that this retraction presents two phases,—the first, during which the lips of the capsular opening tightly encircle the head of the bone, and in that way prevent its return to the glenoid cavity which is free and ready to receive it; the second, in which the head cannot again enter the glenoid cavity, not only because it is thus held by the edges of the capsular rent which permitted its escape, but also because the articular cavity has become too small to receive it, owing to the narrowing and atrophy of the capsule; (3) that these two causes of irreducibility indicate two methods of treat-

ment,—the first being amenable to traction and passive movement, the second requiring operative interference.” (Quoted from the *American Journal of the Medical Sciences*, Vol. xcvi, p. 634.)

Our first case belonged, evidently, to the first class, on account of the ease with which it was reduced. At that time the writer had not become familiar with Kocher's method, so that the success in that case must be ascribed to a lucky chance rather than to any skill.

“M. And. Castex details (*Revue de Chirurgie*, October 10, 1888) six cases of reductions of old luxations of the shoulder by means of a method which consists essentially in using the semiflexed arm as a lever, and causing the head of the humerus to execute the movements of external and internal rotation, flexion and extension, abduction, adduction, and circumduction. In this way he claims that, in the majority of cases, all adhesions may be broken up and the head of the bone replaced more certainly and more safely. If the first attempt fails, he recommends making the second after an interval of three days, the consecutive inflammation producing softening of the adhesions.” (Quoted from the *American Journal of the Medical Sciences*, Vol. xcvi.)

While we have not tried repeated manipulation at different times, still, from the limited experience in our cases, success by the Castex method would seem to be rather due to good luck than otherwise. The head had “lost its right of domicile” owing to the fact that the firm, hard capsule had become embedded in a mass of extensive, newly formed, cicatricial tissue which offered a bar to manipulative reductions that could only have been overcome by an operation.

The most classical and complete consideration of this subject in recent times, we find to be by Edmond Souchon, of New Orleans, and appears in the *Transactions of the American Surgical Association*, Vol. xv, p. 311. He has made a study of 154 operated cases which he collected from the literature. He found that some twenty difficulties and complications were mentioned by the different surgeons dealing with these cases:

“ Capsule thick, dissection tedious, reduction difficult; excessive fibrous tissue around the head and surgical neck; head deeply seated, head adherent to ribs, extensive muscular dissections; old fractures of the tuberosities, of the glenoid cavity, and of the humerus; glenoid cavity filled with the remnants of the capsule and fibrous tissue; glenoid cavity readily freed or cleared; parenchymatous hæmorrhage during operation, wounds of vessels during operation, rupture of the axillary artery in trying to reduce before and after cutting, and various sundry difficulties.”

In our cases we encountered nearly all the obstacles mentioned by Souchon and nearly all the difficulties and accidents during and after operation, except the wounding of the large axillary vessels (in 4 per cent.) and necrosis of the head (in 16 per cent.) which he mentions.

Souchon divides his cases into two chief classes, (1) recent irreducible, (2) old irreducible. All of our cases belonged to the second class. While we could hardly expect a reduction by manipulation, owing to the contraction of the capsule so constant in these cases, we did succeed in one. The chief object of manipulative efforts was to break up fibrous adhesions, and thereby facilitate reduction, and possibly save a large part of the dissection otherwise necessary.

In brief, we may say that our plan has consisted chiefly of

First, manipulation. Using the forearm as a lever, rotating outward and inward, abduction and adduction, never forgetting for a moment a possible accident to the axillary vessels and nerves, and the possibility of fracturing the humerus. If this plan failed,

Second, through incision the capsule and all cicatricial tissue were extirpated. All muscular attachments that offered a restraint were severed, the axillary vessels were protected with a broad, flat retractor, and the head of the bone was brought into place by means of an elevator assisted by manipulation and traction. To avoid infecting the wound in this last manœuvre, it is advisable to firmly wrap the entire arm and hand with wet sublimate towels. Dry towels are liable to slip and become dis-

placed, making it possible for the operator's hands to become infected. If the head cannot be replaced, then

Third, the head of the humerus should be resected. This is an operation to be avoided when possible, on account of the resultant flail-like condition of the arm, and yet must be done (*a*) when the humeral head and neck become too extensively stripped of their attachments, experience having shown that necrosis may occur in 16 per cent. (Souchon) of the cases; (*b*) when osseous union has occurred between the head and the ribs; (*c*) when, after a division of all the restraining, soft parts, the head rests against the point of the acromion process.

AN OS TRIGONUM DETECTED BY THE RÖNTGEN RAYS.

BY HENRY PERKINS MOSELEY, M.D.,

OF NEW YORK,

Radiographer to the Presbyterian Hospital in the City of New York.

THE following case is here presented as being interesting from the stand-point of clinical surgery and also pure anatomy, as it was thought at first to be a fracture of the astragalus, and later shown to be an os trigonum. It has also a medicolegal bearing on the question of the detection of obscure fractures by the means of the Röntgen rays.

The case was treated at the Presbyterian Hospital in the service of Dr. A. J. McCosh, at whose suggestion and through whose courtesy it is reported.

A. M., aged twenty-seven years, was admitted to hospital November 30, 1902, with the history that on the night before admission, while he was helping move a piano, he slipped, and he and the piano fell a whole flight of stairs, the piano striking him on the left leg with the knee flexed, and jamming him against the wall. Soon after the injury he noticed pain and partial loss of function in both the knee and the ankle.

When admitted the left leg was considerably swollen and bruised from the foot to half-way up the thigh. The knee was swollen, and there was evidence of much fluid in the joint. The ankle was swollen, tender, and œdematous, with abrasions over the inner aspect. *Manipulation over the tarsal bones caused pain.* There was much *deep ecchymosis*. There was no crepitus nor false point of motion made out. "No fracture of tarsus or metatarsus made out, but one suspected."

Under cold applications and lead and opium dressings, the ecchymosis and swelling disappeared. Slight pain still remaining, a radiograph was made of the ankle (Fig. 2). The hospital note of that day, December 4, being "X-ray photograph shows a fracture of the astragalus, a portion of its posterior aspect being



FIG. 1.—Normal foot, showing outline of astragalus.



Fig. 2.—Injured foot (left), showing os trigonum.



FIG. 3.—Uninjured foot (right), showing os trigonum.

chipped off." The tenderness in the ankle, however, rapidly disappeared, and the patient was allowed to leave the hospital on crutches on December 9. On December 19, when he presented himself again in the out-patient department, all tenderness had left the ankle, which was, however, the seat of a slight general thickening. The patient was walking without crutches. There was no crepitus obtainable, no false point of motion, and no localized point of tenderness. A radiograph taken then was a duplicate of the first. It was thought that the abnormal shadow might be a chipped-off lower end of the fibula, but a radiograph made in the anteroposterior plane showed the tibia and fibula normal at the ankle-joint. The suspicion that there might here be an abnormal bone was confirmed by a radiograph of the uninjured foot (Fig. 3), in which the same shadow appears.

Dr. George S. Huntington, Professor of Anatomy in the College of Physicians and Surgeons, to whom the writer is indebted for suggestions and for references to the literature, said it was undoubtedly the shadow of an os trigonum,—an abnormal tarsal bone,—which was described by Bardeleben in 1883.

An os trigonum, according to Quain, is an ossicle due to the separation of the external tubercle on the posterior surface of the astragalus and its ossification from a distinct centre. The flexor longus hallucis tendon passes in a groove on the posterior surface of the astragalus, and it is the outer ridge bounding this groove which becomes separated and ossified from a distinct centre.

The fact of the rapid return of function in the ankle-joint after the injury called our attention to the possibility of error in the diagnosis. After the radiograph showed so plainly what appeared at first to be a fracture of the astragalus, the diagnosis of fracture seemed certain. It was not until the possibility of fracture of the other bones had been excluded, and the other foot showed the same abnormal bone shadow, that the conclusion arrived at was warranted.

Such a radiograph as indicated by Fig. 2, if the only one of the series shown, might be very misleading, if any medico-legal question had arisen over the case.

The technique of the radiographs was :

Coil. Twenty-inch, made by Heinze Electric Company, of Boston.

Interrupter. Heinze liquid, making 5000 interruptions per minute.

Tube. Heinze's; vacuum equivalent to a parallel spark gap of one-quarter inch.

Current. One and one-half ampères passing in the primary coil.

Plate. Cramer Crown.

Exposures. Ninety seconds.

Developer. Pyro and Cramer contrast.

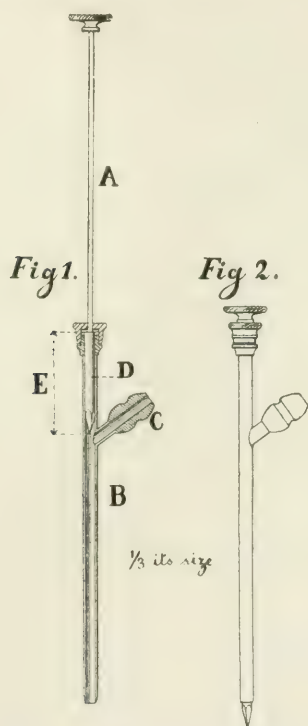
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AN ASPIRATING TROCAR.

BY EDWARD H. OCHSNER, M.D.,
OF CHICAGO.

THE accompanying cut illustrates a little device which I had one of our local instrument makers construct for me about two years ago. It represents a trocar which combines in a very simple manner the essential principles of a trocar and an aspirating syringe.



Combined trocar and aspirating syringe.

A in the figure represents the part which acts as stylet in a trocar and as piston in a syringe; B acts as trocar tube and as syringe barrel; C is small arm which acts as spout, and which may be attached to an ordinary aspirating syringe by means of

a rubber coupling tube. If, now, the stylet is withdrawn so that its point is above the level of arm C, a vacuum is formed in tube B. At times this is sufficient to start the flow of fluid. If the fluid is very thick, it must be helped along by the additional suction of an aspirating syringe.

In order that a vacuum is always produced in barrel B when A is withdrawn, the part of stylet A must of course fit perfectly in tube B; and in order that the instrument be a useful and desirable one, it must do this not only the first few times the instrument is used, but it must continue to act perfectly during the whole life of the instrument, which should be at least two years. This desired result is accomplished by making stylet A as well as tube B of steel, and by working them with the same care and in the same manner as in constructing an ordinary all-metal syringe.

During the two years preceding the construction of this instrument I had made a very extended search in instrument houses and armamentariums of hospitals for a trocar that would fulfil the above requirements. I found several that attempted to do this; but all that I have been able to find and try were disappointing. They were all made of ordinary trocar metal or depended upon packing to accomplish the desired result. The material used in ordinary trocars is either nickelled brass or German silver. Both of these alloys are soft, and after the trocar has been boiled half a dozen times or more in the ordinary instrument tray with the rest of the instruments, the trocar tube becomes indented here and there and the instrument is ruined.

It would seem almost superfluous to call attention to the fact that it is practically impossible to pack a trocar of a No. 9 or No. 11 French scale caliber, the ordinary sizes, and have it so packed that it will stand boiling any considerable number of times.

I have asked a good many abdominal surgeons why they had discarded trocars in gall-bladder operations. So far as I now remember, they all gave me essentially the same answer: "They are all unreliable." It is because of this same experi-

ence, plus the desire of having a trocar that always works, that I began to make a study of trocars some four years ago, and believe the above instrument fulfils all requirements. If the instrument is constructed according to directions, I believe it will always work. The one we are now using has been used in over one hundred gall-bladder operations and in numerous other conditions, such as the aspiration of synovial and pleuritic effusions, and it is in perfect working order to-day, and has not disappointed us in one single instance. In the meantime it has been boiled with all the other ordinary surgical instruments at least five hundred times.

It is very important, however, that the instrument be properly constructed. As said before, both the stylet and the barrel must be made of steel and so ground that parts D and E fit perfectly. Every instrument should be tested in the shop before it is sent out, and again by the surgeon before it is accepted. If this is done, I feel confident it will give satisfaction.

This instrument will be found to be especially useful in infected conditions of the gall-bladder, as with it one can remove the fluid contents of the gall-bladder without the slightest danger of soiling even the outer surface of this viscus, to say nothing of the protection it offers against the soiling of the other intra-abdominal organs or the abdominal incision.

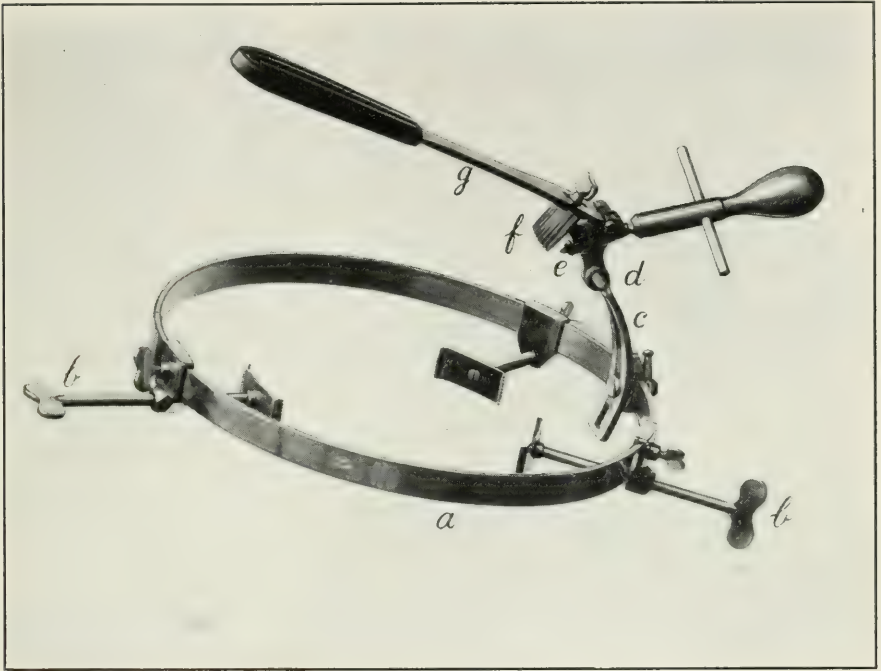
I call attention to this instrument thus in detail because I am told by the local instrument maker that quite a good many of these trocars are being bought by surgeons all over the country; and recently I procured one myself which seemed exactly like the first one I had constructed and am still using with satisfaction, but which proved to be worthless, because it was made of ordinary trocar metal instead of being made of steel. A trocar which may fail at a critical point in a gall-bladder operation is worse than useless, and for this reason it is very important that it be properly constructed.

A NEW OSTEOPLASTIC TREPHINE.

BY W. BARTON HOPKINS, M.D.,

OF PHILADELPHIA.

THIS instrument, through the firm fixation of its centre-pin and the powerful control of its cutter, renders the forming of large osteoplastic cranial flaps comparatively easy and very expeditious. It will cut a three-inch bone-flap in from three to five minutes, and it cuts so smoothly that the shock from cranial jar is, in this preliminary step to operations upon the brain, avoided. Its adjustment may be carefully and deliberately effected as follows: The circular frame (*a*) is clamped by set-screws (*b*) to the head in a position which will bring the adjustable bracket (*c*) approximately over the proposed site of operation, and in a plane beneath the greatest diameter of the head. The pressure of the pads of the set-screws need not be excessive; they can be brought to bear on points best able to stand pressure, and they are made to adhere closely to the integument by covering their surfaces with rubber adhesive plaster, adhesive side out. The curved bracket is next set by a binding-screw in a position which will bring the centre-pin (*e*) nearly in place, when a small incision is made into the scalp to receive it. The final and accurate adjustment is then completed by setting up the lock-joint (*d*) while the centre-pin is held absolutely perpendicular to the cranial dome. The drill-point of the centre-pin is then, by a few turns of its handle, made to engage in the bone. A circular incision of the integument may be made with a scalpel in a line indicated by a gentle impression of the teeth of the cutter (*f*), or a knife may be inserted in the notch of the lever corresponding to the size of the proposed flap. The notches 1, 2, 3, and 4 in the lever, in one of which the cutter is held by the binding-screw, cut flaps two, two-and-a-half, three, three-and-a-half inches in diameter.



OSTEOPLASTIC TREPHINE.—*a*, circular frame; *b b b*, set-screws, to which pads are applied; *c*, curved adjustable bracket; *d*, lock-joint; *e*, centre-pin with drill-point; *f*, cutter; *g*, lever handle.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, January 28, 1903.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

DISLOCATED SEMILUNAR CARTILAGE OF KNEE.

DR. ALEXANDER B. JOHNSON presented a man, thirty years old, a fireman by occupation, who, June 1, 1902, while descending a ladder slipped, and violently abducted his right knee. He felt something snap in the joint, and upon attempting to run he found his knee-joint weak, and he was almost powerless to use the limb. A severe synovitis followed. After the effusion had subsided, he was able to use the limb, but any sudden abduction, or a blow from within outward on the inner aspect of the foot, resulted in his knee giving way under him. He always felt something slip out from the interior of the joint. He was usually able, by manipulation, to push back the projecting body on the inner aspect of the knee, between the tibia and femur.

The patient presented himself for treatment at the hospital in August. Examination of the right knee showed moderate effusion into the joint. Upon certain motions of abduction and flexion the internal semilunar cartilage could sometimes be made to slip out from between the condyles. An operation being decided on, a horizontal cut was made upon the inner aspect of the knee, opening into the joint, which contained a moderate amount of synovial fluid tinged with blood. The internal semilunar cartilage was found torn loose from all its attachments as far back as its posterior and internal fourth, at which point there was a rupture of the cartilage, leaving it attached by a narrow isthmus at its

posterior border. The larger fragment, composing about three-quarters of the cartilage, was removed. The joint was washed out with salt solution and closed by sutures. The limb was placed upon a posterior splint and kept quiet for a fortnight. The wound healed without complications, and two months ago the patient was able to resume his arduous and difficult occupation as a member of the fire department.

The motions of the knee-joint are perfect. He has no pain in the joint, but states that occasionally, upon making a sudden muscular effort, he feels and hears a snapping in the interior of the joint. This symptom is not accompanied by pain or disturbance of function. The knee-joint is normal in appearance. He wears a knee-cap made of some elastic material.

CHOLECYSTECTOMY.

DR. JOHNSON presented a woman, aged forty-seven years, who was admitted to the hospital August 18, 1902. Excepting for a constipated habit of the bowels, she had always enjoyed vigorous health until five months ago, when she was suddenly seized with a severe shooting pain in the right hypochondrium, radiating through to the back and scapular region. This attack was accompanied by a chill and vomiting. There was no jaundice. The acute pain lasted about ten hours, and was followed by a more or less continuous pain of moderate severity, which persisted until the occurrence of her second severe attack; this was similar in character to the first attack and occurred about seven weeks ago. The patient became jaundiced during this attack, the jaundice persisting, with characteristic symptoms, for six weeks.

A third severe attack of pain occurred two weeks ago, which was not accompanied by jaundice. A dull pain in the region of the gall-bladder has continued up to the present time.

Upon admission to the hospital, an examination revealed a well-nourished patient. She was slightly jaundiced. No tumor could be felt through the thick abdominal wall, but there was tenderness upon deep pressure over the region of the gall-bladder. The liver was not enlarged. At the time of her admission, the patient's temperature was 100° F.; pulse, 80. An examination of the blood showed 64 per cent. of hæmoglobin and 12,200 leucocytes. The urine was normal, excepting that it contained bile pigment.

The patient was operated on August 22, 1902, four days after her admission to the hospital. A vertical incision, four inches in length, was made downward, beginning an inch below the ninth costal cartilage. The gall-bladder was found to be moderately enlarged; it contained numerous stones, which were readily palpated. There were but few adhesions, and the gall-bladder was but loosely connected to the liver structure. It was separated from its attachments as far down as the cystic duct and then cut away. The cystic duct was found to be patent downward into the gut, admitting a good-sized probe throughout its entire length without difficulty. The cystic duct was surrounded by a purse-string suture and inverted. A strand of gauze, surrounded by rubber tissue in the form of a wick, was introduced down to the stump of the cystic duct, and the remainder of the wound was closed by sutures. The bleeding was inconsiderable. The wound healed *per primam*, leaving a sinus from which a small amount of bloody serum continued to escape for several weeks. There was no discharge of bile, and convalescence was uninterrupted. The patient was allowed out of bed on the twenty-first day, and left the hospital in good general condition three days later. Since then her general health has remained good.

The report of the pathologist was as follows: The gall-bladder measures six by two and one-half centimetres, and contains twenty light colored, slightly faceted calculi, the largest being one centimetre in length. There is considerable thickening of the wall of the gall-bladder; section shows extensive loss of its epithelial lining, and chronic inflammation of all the coats. The thickening is largely due to a deposit of fibrous tissue in the subperitoneal coat. Cultures made from the interior of the gall-bladder remain sterile.

EXCISION OF COSTAL CARTILAGE AND PARIETAL PLEURA FOR RECURRENT CARCINOMA OF THE BREAST.

DR. ELLSWORTH ELIOT, JR., presented a woman, fifty-eight years old, who was admitted to the Presbyterian Hospital, May 21, 1900, with the following history. Eighteen months previous she had noticed a small lump in the right breast. This gradually increased in size, and in October, 1899, ulceration of the skin took

place. This ulceration had existed about seven months at the time of her admission to the hospital.

Inspection of the right breast showed a mass about the size of a pineapple, which extended three and one-half inches to the right, two and one-half inches above, and one inch below the nipple. This mass was movable on the deeper parts. No enlarged glands could be felt in the axilla. May 23, 1900, the mass was removed by a wide excision, including both pectoral muscles and the axillary contents. Subsequently, there was some infection from the ulceration, and the patient's temperature rose to 104° F. It gradually fell to normal, and the wound closed without further complication. An interesting feature of the operation was that although the glands in the axilla were apparently normal in size and appearance, yet upon microscopical section they showed beginning carcinomatous infiltration.

The patient left the hospital in less than three weeks after the operation. She was seen from time to time and carefully examined, but there were no signs of a recurrence until November, 1901,—that is, about eighteen months after the operation. The patient then returned, and said that about six weeks before she had noticed a small lump two inches below the cicatrix. This lump was quite firm; the skin covering it was discolored and slightly adherent, but it had not ulcerated. Without any delay the tumor was excised, together with the underlying costal cartilages and parietal pleura. This operation was done through an elliptical incision. When the pleura was opened, there was no apparent disturbance of either respiration or circulation. The left lung popped up into the wound, and the heart could be seen pulsating through the adjacent pericardium. The parietal pleura was stitched to the lung and the external wound was closed. No reaction followed the operation, and there was complete expansion of the lung on that side. The wound closed by primary union.

A microscopic examination of the growth showed that it was carcinomatous in character, similar to the original breast tumor. The costal cartilage had also become invaded by the cancerous tissue.

Fourteen months had elapsed since this second operation without any signs of further recurrence. At the time of the primary operation, the middle and lower subscapular and the posterior thoracic nerves were left untouched, and in consequence

of this, the patient has excellent use of her arm, notwithstanding the loss of the pectoral muscles.

DR. HOWARD LILIENTHAL said he had had some experience in the excision of the ribs, together with parietal pleura; and in one case he met with an accident which he believed might happen to any one. In the case referred to, he attempted to suture the parietal pleura to the lung. Following this operation, there was a valve-like formation, and the patient got up a tremendous acute pneumothorax, which threatened his life. The perforation through which the air entered could not be located, and aspiration was resorted to. The patient subsequently died of an abscess of the lung, for which the operation had been originally undertaken.

Dr. Lilienthal said that some time ago he presented a case at one of the meetings of the Surgical Society where he had excised a section of pleura about two inches by three inches in size. The case was one of melanotic sarcoma of the rib. In that instance he made no attempt to suture the pleura, but packed the wound tightly. The patient recovered without a single untoward symptom. Although it was usually advised to resort to suturing in these cases, the speaker said he did not regard it as a reliable procedure; he would place more reliance on packing.

DR. WILLY MEYER said he had had two operations of this kind, both being instances of recurrent carcinoma of the breast, with involvement of the costal cartilage. In one, where evidently the anterior aspect of the cartilage had become involved, he succeeded in stripping the parts off the parietal pleura; in the other he tried to do the same, but the pleural cavity was accidentally opened. He lost no time in packing the wound as tightly as he could, and no immediate collapse of the lung followed, but at the end of the second day a profound collapse of the lung on that side occurred.

Dr. Meyer said that whenever it was possible, he would stitch the lung to the parietal pleura and close the wound at once. If this was impossible, he would resort to packing. In the case he had referred to, where air entered the pleural cavity and was followed by collapse of the lung, it took many weeks for the patient to recover.

In reply to a question, Dr. Meyer said there was no regional recurrence in the case where he had left the costal pleura. Some

time later a disseminated cancer appeared, to which the patient succumbed after a while.

DR. ARTHUR L. FISK said it seemed to him that the procedure resorted to by Dr. Cabot in the treatment of empyema might be advantageously employed in these cases. Dr. Cabot uses a sheet of rubber tissue which overlaps his dressing by about one inch. The rubber tissue prevents the entrance of air into the pleural cavity on expiration, but on inspiration permits of free escape of any that is inside.

DR. HOTCHKISS said he had had one case of carcinoma of the breast in which there was a recurrence three years after the primary operation, involving the second right costal cartilage. This was removed without opening the pleura. The patient died in a few months of a mediastinal growth, which was probably present at the time of the second operation.

DR. ELIOT, in closing, said that he did not think the removal of cartilage without the underlying pleura a valuable measure, owing to the probability of involvement of the latter structure.

He also said that collapse of the lung and severe respiratory and circulatory disturbances were more apt to occur in those cases where a small opening was made in the pleura than in those where the pleural cavity was freely opened, the small opening acting as a valve.

Dr. Eliot referred to another case of recurrent carcinoma of the breast in which the primary operation had been done in New Haven, in April, 1900, eighteen months after the onset of the disease. About a year after the operation the patient came to the Presbyterian Hospital with a recurrent tumor at the inner angle of the cicatrix. It was about the size of an orange, slightly ulcerated, and firmly fixed to the underlying costal cartilage. An operation was not deemed advisable, but the patient insisted. The case was treated practically in the same way as that which he had presented, but the postoperative developments were entirely different. Owing to the necessary extensive sacrifice of skin, a hole was left in the pleural cavity large enough to admit a man's fist. During the operation no change was observable in the patient's respirations, nor was the pulse-rate increased; but, owing to the ulceration, the wound suppurated and an ordinary empyema developed, with temperature elevation, and an increase in the pulse and respiration. After the fourth day, these acute symptoms de-

creased in severity, and the patient's recovery was not otherwise interrupted. The operation was done eighteen months ago, and up to the present time there have been no indications of a further recurrence, although the resulting abscess cavity is still slightly discharging, and the extensive denuded area over the chest has not entirely cicatrized.

CHOLECYSTECTOMY AND CHOLEDOCHOTOMY.

DR. CHARLES L. GIBSON presented a man, sixty-nine years old, who entered the hospital last August, giving a history of having had symptoms of intermittent jaundice and cholelithiasis for about two years. A year ago he had had a severe attack of jaundice, and since then intermittent attacks. When he came into the hospital he was deeply jaundiced, and in such poor general condition that an immediate operation was not deemed advisable. After keeping him under observation for several weeks his jaundice largely disappeared, and the clotting quality of the blood increased. On the 10th of August, 1902, the abdomen was opened, and on exposing the gall-bladder it was found to be much distended, resembling in appearance a loop of intestine. It contained no stones. On opening the common duct, which was readily identified, it was found to be free from stones. The ampulla was found to be greatly dilated, readily admitting a No. 26 French bougie, which indicated that the calculi had probably escaped into the intestine.

After removal of the gall-bladder, the wound in the duct was drained, and the man made a perfectly smooth recovery. Since the operation he had entirely recovered his health and had been free from all pain.

CHOLECYSTECTOMY AND CHOLEDOCHODUODENOSTOMY.

DR. GIBSON presented a woman, thirty-five years old, who was admitted to St. Luke's Hospital in the summer of 1901 with an attack of typhoid fever, from which she made a good recovery. Subsequently she had an attack of gall-stones, complicated with jaundice, for which an operation was advised, but the patient refused, and left the hospital. She returned in July, 1902, and stated that since the previous December she had suffered from attacks of pain in the region of the gall-bladder, with more or less gas-

tric and constitutional disturbance. When she was admitted, there was a slight, fading jaundice, which disappeared entirely before she left the hospital, twelve days later.

When she was readmitted, October 16, she was deeply jaundiced, and was suffering from an attack of typical, biliary colic, dating back six days. When the abdomen was opened, November 13, 1902, Dr. Gibson found a stone so tightly wedged in the ampulla that it was impossible to dislodge it. In order to gain access to it and remove it, it was necessary to open the duodenum transversely and slit up the ampulla. The gall-bladder was then removed, and the patient made a satisfactory recovery.

DR. LILIENTHAL thought the operation of duodenostomy ought to be avoided if it possibly could be. Recently he had a patient with a large-sized stone in the ampulla, upon whom he performed cholecystectomy, and at the same time removed the stone. He succeeded in doing this by rotating the duodenum, pushing the stone between the pancreas and gut, thus bringing it up into the wound, and then incising the ampulla and removing the stone. Immediate suture of the duct was practised. The patient was fully convalescent within a week after the operation and very promptly recovered. Dr. Lilienthal said that if a small leak remained in the intestine after doing a duodenostomy, it was very apt to become larger, and the patient was in danger of dying of starvation. He recalled such a case, which he saw in the hospital last summer, in charge of one of the other surgeons, where the patient died of inanition due to a leak in the duodenum. Although duodenostomy had been advocated by men of high standing, and while it was comparatively simple and theoretically a good operation, still, it entailed an opening into a section of the bowel which should not be interfered with, if possible.

As to the original incision in these cases, Dr. Lilienthal said he preferred the straight incision through the fibres of the rectus to the transverse cut made by Dr. Gibson. He had found that the former answered every purpose, both in the simple removal of stone from the common duct and in cholecystectomy. Through such an incision, the hepatic and common ducts could be drawn up into the wound and manipulated and examined with great exactness.

INTESTINAL OBSTRUCTION BY BAND.

DR. GIBSON presented a man, forty-two years old, who entered the hospital December 25, 1902, with the history that he had had no movement of the bowels for a week. His previous history was negative, with the exception that one year ago he had a fairly acute attack of appendicitis.

When Dr. Gibson first saw the patient, there was faecal vomiting. The abdomen was much ballooned, and there was a point of great tenderness in the right hypogastrium. An incision was made in this region, revealing a peculiar condition of the surface of the liver; it was roughened by numerous small elevations, not unlike a tuberculous condition, for which no satisfactory explanation could be offered. Below the liver a loop of intestine was found which was unevenly dilated. The real cause of the intestinal obstruction proved to be a cord-like band binding down two loops of gut and strangulating a third loop underneath. This band was divided, thus relieving the strangulation, and the man made an uneventful recovery. There was no satisfactory movement of the bowels until four days after the operation.

APPENDICOSTOMY (WEIR) FOR THE TREATMENT OF
CHRONIC ULCEROUS COLITIS.

DR. WILLY MEYER presented the woman whose case had been mentioned at the last meeting. She was fifty-three years old, and for two years previous to coming under observation had suffered from frequent diarrhoea, sometimes accompanied by pain. During the past three months her symptoms had become aggravated. There were frequent, watery evacuations; these were extremely painful, accompanied by a bloody discharge, and had an exceedingly foul odor. During her recent illness she had lost sixty pounds in weight.

When the patient entered the German Hospital, October 20, 1902, an inspection through the rectoscope showed that the lower bowel was covered with numerous ulcers, and above these a cock's-comb-like granulating mass could be seen. The ulcerations were apparently specific in origin. The entire large intestine was tender on palpation, and it was to be concluded, from the patient's history and the great loss in weight and strength, that similar ulcer-

ations probably extended throughout the entire transverse and ascending colon. Instead of flushing the bowel from below, therefore, it was thought best to make an opening above and introduce the irrigating fluid through the cæcum. If the patient had not been in such a weakened condition, Dr. Meyer said, he might have resorted to the Kader method, as proposed by Dr. Gibson, with reference to colostomy, so that a large-sized tube could be introduced, but, after due consideration, Weir's method of irrigating the bowel through the appendix was decided upon.

October 8, 1902, the abdomen was opened by means of the intermuscular incision, and a comparatively small appendix found. It was drawn through the wound in an oblique direction until its tip protruded about half an inch; the tip of the meso-appendix was then stitched to the subcutaneous fat at the lower angle of the wound. The wound, including the skin, was then closed by layer sutures and the tip of the appendix amputated. A flexible bougie could be passed into the cæcum; its size corresponding to about No. 11 or 12 French, later, also, a soft rubber tube. The opening into the appendix was tied for the first twenty-four hours after the operation, to avoid the danger of soiling the wound. After the first day, the large intestine was regularly flushed through the tube in the appendix, at first with a 1-10,000 silver nitrate solution, followed by a saline solution; subsequently, the strength of the silver nitrate solution was increased. Under this treatment, the health of the patient has materially improved, although there are still some ulcerations in the rectum. She had gained fifteen pounds since the operation. Dr. Meyer considers Dr. Weir's proposition a valuable addition to our operative resources. It certainly is a fascinating idea, of making this use of the otherwise useless organ.

TUBERCULOUS FEMORAL LYMPH NODES.

DR. CHARLES N. DOWD read a paper with the above title, for which see page 746.

DR. A. B. JOHNSON related the history of a case of tuberculosis of the femoral lymph nodes in the person of a young man who, in the course of an acute gonorrhœa, had developed an adenitis in the groin. The gonorrhœa got well, but the adenitis per-

sisted, and upon removing the enlarged glands they were found to be tubercular. At the time of operating, the speaker said, he did not look for enlarged glands within the pelvis, and he was unable to say whether any were present or not. In the course of a few months the man developed acute phthisis and died within a year.

About a fortnight ago, Dr. Johnson said, he saw a man who had a tuberculous trouble affecting one knee-joint thirteen years before. The joint was scraped at the time, but not excised. The disease speedily recurred, and when he came under the speaker's care, the limb was very painful and enormously enlarged, giving one the impression that the case was one of sarcoma of the femur and tibia. There was a large mass of glands in the femoral region, and also a number in the pelvis and within the abdomen. The case was regarded as practically hopeless, but, in order to give the man some relief, the limb was amputated at the level of the lesser trochanter. Since the operation, which was done only two weeks ago, the enlarged glands have grown much smaller.

Dr. Johnson said he had seen several cases of tuberculosis of the femoral lymph nodes in which, contrary to the experience of Dr. Dowd, the ultimate prognosis was by no means good. The cases he had in mind were those in which the lymphatic nodes of the neck, axilla, and the femoral region were simultaneously affected, or in which different parts of the body became the seat of tubercular disease. In several such cases the autopsy showed that the glands of the mesentery and mediastinum were also the seat of tuberculous disease. The speaker said he recently saw a boy who had a tumor in the right iliac region which was looked upon as the evidence of an acute appendicitis. Upon opening the abdomen, the tumor was found to consist of a large mass of tubercular lymph nodes in the neighborhood of the iliac vessels. Upon the removal of these, the patient made a prompt recovery. The appendix was found to be normal.

DR. LILIENTHAL said it seemed to him that the particular interest in the cases reported by Dr. Dowd lay in the fact that they were all instances of inoculation tuberculosis from injuries. They certainly represented a remarkable collection of cases. In the case mentioned by Dr. Johnson, where the patient developed acute phthisis after an attack of gonorrhœa, the probabilities were that

the tubercle bacilli had existed in the lungs or elsewhere before the onset of the gonorrhœa. There was no good reason to suppose that the infection came from the urethra. Dr. Lilienthal said it was not unusual to see inflamed glands in the neighborhood of a suppurative coxitis or an osteomyelitis of the femur, and these are usually looked upon as tubercular, but the cases reported by Dr. Dowd were both unusual and suggestive.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, February 2, 1903.

The Vice-President, A. J. OCHSNER, M.D., in the Chair.

EXCISION OF THE CÆCUM.

DR. JACOB FRANK presented a child nineteen months old. He said that twelve months ago he was called at eleven o'clock at night to see the child, and found it in a critical condition. The history given by the mother was that the child had always been a "colicky" baby. About two months before it was operated upon, its bowels were frequently constipated. Vomiting spells were frequent, but the child had never vomited any fæces. The child was playing on the floor, when suddenly it was seized with a severe pain, vomited, and passed blood, after which it became very ill. He made a diagnosis of intussusception; the mother took the child to the hospital, and at about two o'clock in the morning he opened the abdomen; in examining the coils of intestine he did not find what he thought was a recent intussusception, but in making a further examination he came upon the appendix, which seemed as though it were binding the cæcum down. He removed the appendix, and in following the cæcum he found it was a hard mass. He therefore resected the entire cæcum, making practically two operations. He used one of his absorbable bone couplers in making the intestinal anastomosis, and removed the stitches at the end of seven days. In ten days the child left the hospital. The child was now in perfect health. The specimen was exhibited.

STRICTURE OF THE ŒSOPHAGUS TREATED BY GASTROSTOMY AND GRADUAL DILATATION.

DR. A. J. OCHSNER presented a man thirty-four years of age, who came under his care at the Augustana Hospital February 17, 1899, giving the following history:

Aside from having experienced repeated attacks of malaria, the patient's health has been good since childhood. He lived in a malarial district during his youth. He has never swallowed lye or any other escharotic. During the past fifteen years he has experienced some difficulty in swallowing. He first observed the necessity of drinking large quantities of water while eating, in order to wash down the food. The amount of fluid required has become greater and greater constantly. For a considerable time he has been in the habit of eating and drinking all he expected to consume at one meal; then he would drink several goblets of water, and with a species of straining he would force the entire meal, which apparently had accumulated in the lower part of the œsophagus, into the stomach. Then he would gulp up the superfluous water to the amount of about one pint.

At the time of admission he was well nourished, strong, and muscular, tongue clean, appetite good, bowels constipated. Heart, lungs, and kidneys are normal. Upon permitting the patient to drink one to two pints of fluid, he complains of a feeling of weight in the epigastrium. Percussion elicits an area of dulness in the epigastrium to the left of the median line and upward towards the left nipple. Bismuth was suspended in the fluid swallowed and skiagraphed. This showed a club-shaped shadow in the area indicated by the dulness, twelve centimetres wide at its widest point, which at the same time was the lowest portion.

If patient drinks still more fluid he becomes greatly distressed. He then goes through a convulsive motion, his eyes bulge out similar to the condition seen in children during a paroxysm of whooping-cough. Then suddenly he feels a relaxation, and the greater portion of the fluid has passed into the stomach. The remaining portion is gulped up and the patient is relieved. The regurgitated portion of fluid is free from hydrochloric acid. This condition has become more and more distressing, the patient finding greater difficulty in forcing anything into the stomach. There is as much difficulty in getting water or any other fluid into the stomach as there is in swallowing food of any kind which permits of thorough mastication.

These symptoms indicate the presence of what has been called a spasmodic stricture of the lower end of the œsophagus, but which is probably due to the peculiar arrangement of the muscles of the diaphragm at the point at which the œsophagus passes through

the latter structure in these cases, as has been demonstrated by a case operated by Ross, of Toronto.

Every attempt of passing bougies of any size, even filiform bougies, through the stricture had failed, both with and without the use of cocaine. The patient's condition had become most pitiable, when the following plan of treatment was instituted. The patient was anæsthetized, and another attempt was made to introduce bougies of various sizes, but this again failed. An incision twelve centimetres long was then made through the outer edge of the left rectus abdominis muscle opposite a point half-way between the umbilicus and the sternum. Bougies were again introduced into the œsophagus through the mouth, but could not be passed into the stomach, neither could they be felt with the hand in the abdominal cavity. The anterior wall of the stomach was then brought up and sutured to the parietal peritoneum, and the transversalis fascia and the exposed surface of the stomach between the edges of the abdominal wound were tamponed with iodoform gauze. This part of the operation was badly planned. Some provision should have been made to prevent leakage after the stomach was opened, either by Witzel's method or by some other equally efficient plan.

The stomach was opened two days later and an unsuccessful attempt was made to bougie the œsophagus from below. During the following week attempts were made daily to pass bougies through the stricture, but all of these attempts failed, until a fine flexible bougie found its way into the stomach ten days after the operation. A number of attempts had also been made to pass a thread through the stricture by having the patient drink it with water, but these failed, probably because of the peculiar form of the obstruction. Ordinarily, a fine thread placed in a glass of water and threaded through a drinking tube can be carried through even a narrow stricture into the stomach if the patient drinks the thread with the water through the drinking tube.

The end of this bougie was brought out through the opening in the anterior wall of the stomach, and a large-sized braided silk suture was tied to its end. The bougie was then withdrawn, and in this manner the silk cord was passed through the œsophagus. A still heavier silk cord was now attached to this cord double, and was drawn through the œsophagus; then one of the free ends of the cord was drawn through the loop and tied to the other free

end. In this manner a very convenient continuous double silk cord was placed permanently through the œsophagus, as shown in Fig. 1.

The following day a small rubber tube was looped through this cord and drawn through the œsophagus and left in place in the stricture for a few moments in order to dilate the latter. Then two rubber tubes were looped into the first one, and these were drawn through the constricted portion, as is shown in Fig. 2.

Each day the size and number of these tubes were increased until the mass of tubes measured three centimetres in diameter when tightly pressed together. By this time the patient could swallow any kind of food normally in any desired quantity.

In the mean time, however, the gastric fistula had become very troublesome. One of his assistants, Dr. H. H. Hanstein, devised a very ingenious pneumatic rubber apparatus with which he closed the opening, but the patient insisted on having the fistula closed, and this was accomplished by an operation May 8, 1899, seven weeks after the original operation. The stomach was loosened and the wound closed by means of Lembert sutures. A small fistula persisted for some time, but healed under treatment with cauterization.

It is now four years since the operation, and it is still possible to pass an ordinary olive-pointed bougie fifteen millimetres in diameter into the stomach. This has been done several times each month during the past year, because there has been some tendency to recurrence. Swallowing has become more and more difficult constantly, notwithstanding the fact that it is possible to pass the bougies. It will consequently become necessary sooner or later to perform another operation. The operation advised by Ross, consisting in a division of the constricting bands, will be indicated, and will probably give permanent relief.

Aside from the evident advantages this method presents in itself, it can be employed very satisfactorily in connection with the method described by Abbe as the bowstring method. The bowstring of Abbe can be introduced by means of the endless double silk cord, then a sufficient number of rubber drainage tubes can be drawn into the stricture to make it perfectly tense. In this manner the stricture can be cut, and more readily with the bowstring than it could were its edges in a relaxed condition.

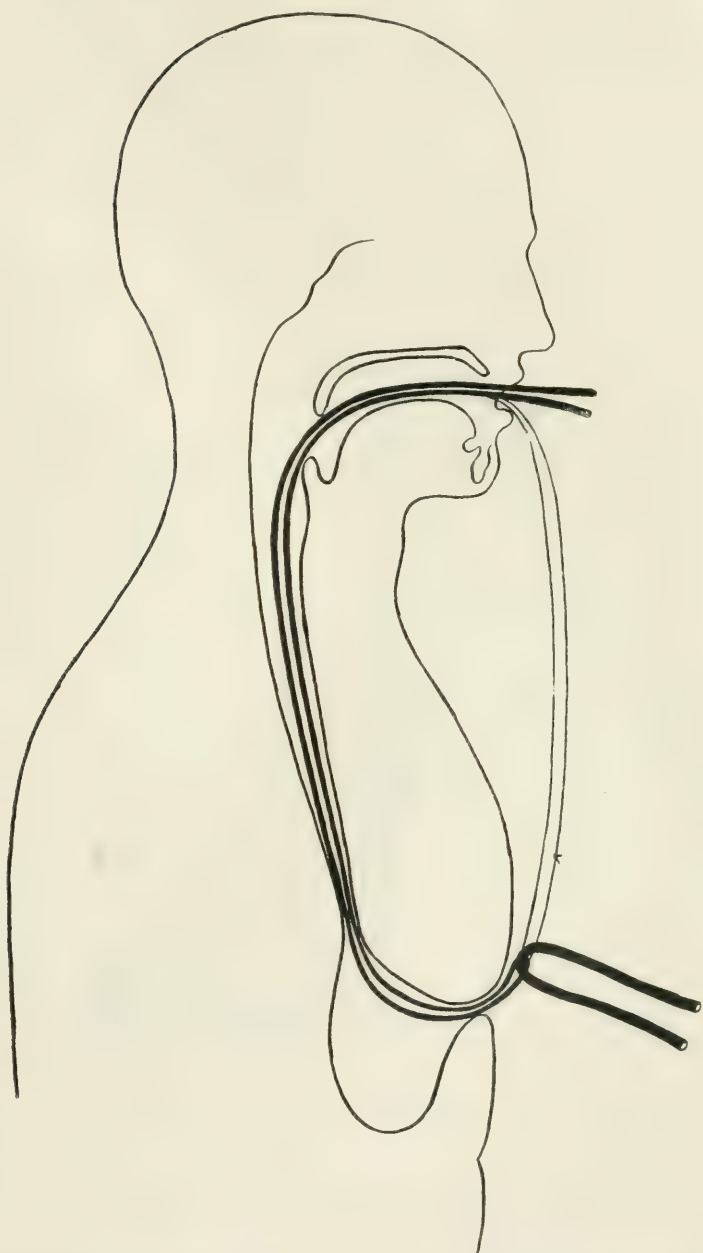


FIG. 1 shows a second rubber tube looped into the first one. This is repeated with larger tubing to increase the dilatation.

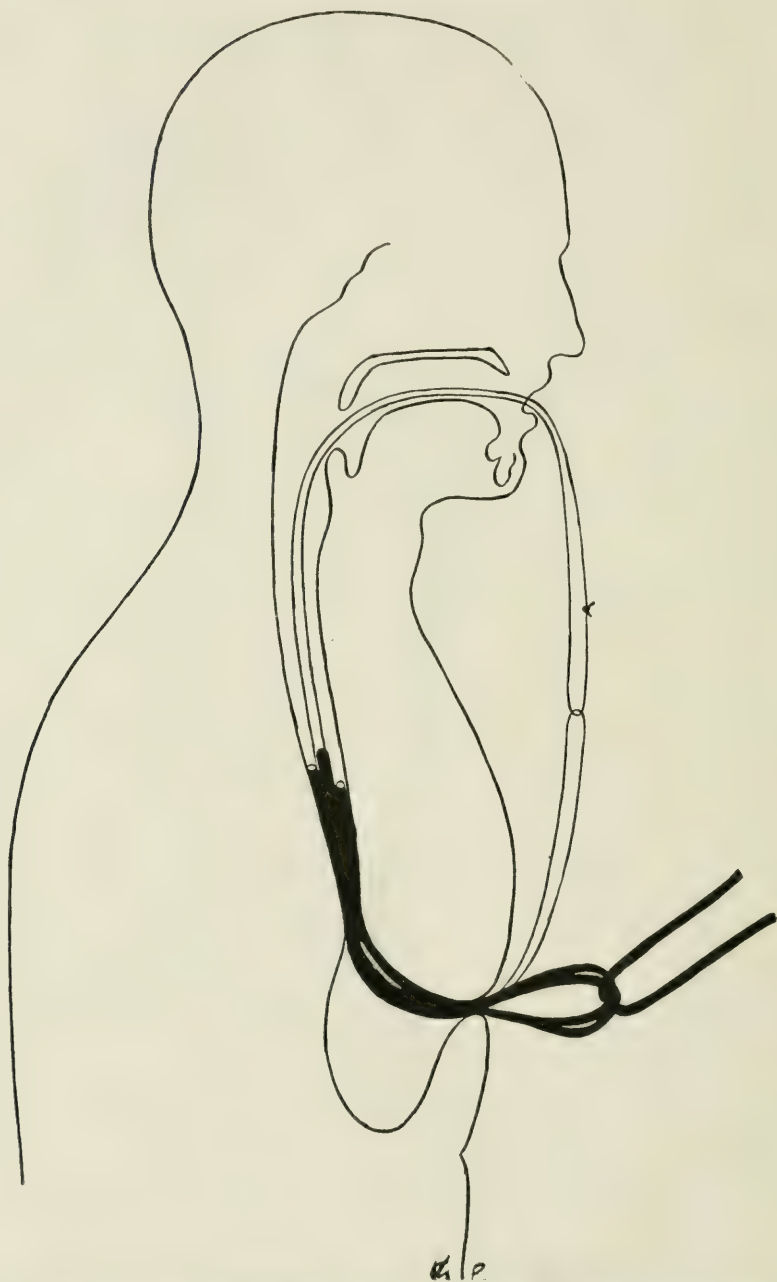


FIG. 2 shows the tubes in the stricture, where they are permitted to remain for the purpose of increasing the dilatation by their own elasticity.

DR. D. W. GRAHAM stated that the history did not seem compatible with any pathological lesion, and the case did not correspond to a malformation. He had never seen a case of diverticulum of the œsophagus; but while the author was reading his paper, it occurred to him that possibly it might be something of that kind. There were numerous cases reported in the literature.

DR. A. E. HALSTEAD stated that the question of diverticulum had interested him, because not long since he had operated on such a case. In his case a large bougie could be passed without any difficulty through the stricture, although a small one was impassable. The patient was unable to swallow food of any kind, either fluids or solids. After swallowing a mouthful or two of food, the diverticulum would fill again and close the œsophagus. This was a characteristic point in the diagnosis of a diverticulum. He described on the blackboard the peculiar features of the diverticulum in his case.

DR. A. I. BOUFFLEUR stated that while he had not had a large experience with the class of cases under consideration, his impression was that some dilatation of a stricture of the œsophagus frequently occurred after a simple gastrostomy without the use of any bougie. With a stricture located as this one was, one ought to be able to dilate it with the finger if the proper method were resorted to, and this method consisted in making an opening in the stomach early in the operation, to empty the stomach, and by having the opening very small, so that it would just pass over the finger, one could carry the hand well up in the abdominal cavity with the finger within the stomach. He remembered seeing Dr. McCosh dilate such a stricture a few years ago, at which time he introduced his whole hand into the stomach. There was serious objection to this, and by invagination the same effect could be secured without so much danger.

In a case which he operated on two weeks ago, he was unable to carry this out, on account of the condition of the patient. The patient had taken absolutely nothing by the mouth for six days, not even a teaspoonful of water, also had expelled promptly any nutrient enemata. In this case he did a gastrostomy, and after opening the stomach he passed a bougie from below up through the stricture without any difficulty. In the course of a week, without any further dilatation, the patient was

able to drink freely, and within three days after this he was able to take boluses of bread. From what he could learn, it was quite a common thing for these strictures to dilate somewhat spontaneously when the congestion and œdema of the parts were relieved by the performance of a gastrostomy.

DR. ARTHUR DEAN BEVAN said there was one point he would like to suggest as to the possibility of the pathology of the condition. Might it not be possible for one to have a stricture of the œsophagus or œsophageal opening in the stomach from a gastric ulcer, just as one would have obstruction of the pylorus, or obstruction from a carcinoma of the œsophageal entrance of the stomach? Would it not be possible to imagine such a condition explaining the pathological condition? The exact cause of the obstruction in Dr. Ochsner's case was not clear to him.

DR. OCHSNER, in closing the discussion, said there was no doubt but what gastric ulcer could cause a stricture at the point mentioned, and in connection with the articles referred to by Dr. Halstead, the condition in some of those cases was similar to a spasm of the sphincter ani muscles in fissure, so that in some of them, by simply washing out the œsophagus regularly and giving bromide of soda and sedatives, the œsophageal spasm became less violent, and presently patients got well without any operative treatment. He saw a case a short time ago in which the food was expelled the moment it was swallowed constantly, for a number of weeks, so that the patient became greatly emaciated, and it seemed as though a stricture of the œsophagus existed. It was possible to pass sounds into the stomach. A gastrostomy was made, and an ulcer found directly opposite the point at which the œsophagus emptied into the stomach, so the moment it entered the stomach it caused a spasm, and the food was ejected at once. The stomach had decreased in size, so that its diameter was less than that of the jejunum.

It seemed to him sensible to give the food a good opportunity to go on into the intestine, so he made a gastro-enterostomy to drain the irritated stomach thoroughly, and immediately the patient began to improve, gain in weight, and she had been gaining rapidly ever since. He thought the method of von Eiselsberg in such cases would be attended with considerable risk, because of the fact that the tube could not be reintroduced if it were accidentally withdrawn.

In connection with the remarks of Dr. Bouffleur, it occurred to the speaker that if he had carried a tube similar to Jacob's catheter, only larger, up through the stomach and out through the mouth, and fed the patient until she had gained sufficient strength so that he could remove the diverticulum which existed, possibly he might have saved her life, but making a gastrostomy and trying to feed the patient in that way seemed too severe an operation, so the patient died from shock.

At the operation in this particular case he tried to invaginate the stomach, but could not insert the stomach wall into the œsophagus, and he felt timid about opening the stomach and examining it from within. This was four years ago, at which time surgeons were more afraid of the stomach contents than they are now. At the present time he would have opened the stomach directly and examined it in that way.

He had no doubt that there was a congenital element in his case. Some time ago a writer, whose name he could not recall, published an article in the *Archiv für klinische Chirurgie*, reporting a large number of sections of the œsophagus, and it was found that there were congenital narrowings at certain points in the œsophagus, and the point at which the œsophagus crosses the diaphragm is one of the points at which there is a natural narrowing. He believed that his patient from childhood had had this narrowing. It was now nineteen years since he began to find it was necessary to drink a lot of water to swallow his food.

REVIEWS OF BOOKS.

CANCER AND OTHER TUMORS OF THE STOMACH. By SAMUEL FENWICK, M.D., F.R.C.P., Consulting Physician to the London Hospital, and W. SOLTAU FENWICK, M.D., LOND., M.R.C.P., Senior Physician to the London Temperance Hospital; Physician to the Evelina Hospital for Sick Children. Pp. 354. Philadelphia: P. Blakiston's Sons & Co., 1903.

Any work that tends to add to our knowledge of cancer, no matter of what part of the body, should be welcome; and when one stops to consider the single question of the difficulty of diagnosis of gastric cancer, he turns eagerly in search of help to any source of information which presents. In the volume before us the Drs. Fenwick offer the result of their personal observations on 265 necropsies occurring in their service at three large London hospitals, together with an analysis of 3679 cases from other sources. The record of so large a personal experience must of itself command a respectful reception; but the most cursory perusal of the book shows that the authors bring to the consideration of their subject a thorough appreciation of its breadth, an attention to detail, a power of analysis, and withal a generous conservatism which bespeak the master craftsman.

The scope, as outlined in the preface, deals with etiology, pathology, and symptomatology rather than with treatment, although a chapter is devoted to that important branch. "As the work has necessarily been written from the stand-point of a physician, we have merely sought to indicate the various conditions which in our experience seem to warrant or to contraindicate surgical interference, and have left all discussions relative to operative

technique to those who are better qualified to deal with the subject."

The relative frequency, and consequently importance, of carcinoma fully warrants the greater space given to that variety of neoplasm, the consideration of which occupies fully two-thirds of the book. About 100 pages are devoted to sarcoma, benign tumors, foreign bodies, and tumors of the duodenum. It is of interest to note that the varieties of carcinoma are classed as "scirrhus," "medullary," and "adenocarcinoma."

Analysis of the authors' own cases seems to prove that, contrary to generally accepted data, both sexes are equally liable to gastric cancer, and that susceptibility increases up to seventy-five years; the death-rate by decades being respectively, 45-55, 23.7 per cent.; 55-65, 29.6 per cent.; 65-75, 24.8 per cent. The rate in the last decade would be much higher could all deaths from cancer be collected, the above including only hospital deaths, and not those occurring in almshouses and other refuges for the aged. The above figures are of particular interest to the Reviewer, as in a home for aged people with which he is connected the eighteen deaths in the last five years include seven from cancer, or 40 per cent. Two of these were carcinoma of the stomach, and there are now in the home two other cases of intestinal carcinoma.

A series of tables is arranged to show the portion of the stomach most frequently attacked, the form of tumor common to each section, the relation of the form and position of the neoplasm to the various symptoms, etc. It would appear from these that pain is most frequent and most severe when the walls and curvatures are attacked, and that growths of the cardia are least painful, while severe pain after meals is suggestive of ulceration. Vomiting is most frequent, as one would expect, in stricture of the pylorus. The authors are inclined to believe that hæmorrhage is much more frequent than is generally supposed, and suggest that constant unsuspected leakage is the chief cause of the cachexia accompanying gastric cancer.

Valuable chapters are devoted to diagnosis and treatment. The tabular arrangement of differential symptoms is particularly to be commended. The difficulty of distinguishing carcinoma from gastric ulcer is dwelt upon at some length.

Commenting on the occasional occurrence of sarcoma, the following differential points are suggested: (1) Sarcoma is more frequent under thirty-five years. (2) Slight continued pyrexia plus rapid and profound anæmia. (3) Splenic enlargement. (4) Sympathetic enlargement of the tonsils and follicles of the tongue. (5) Sarcomatosis. (6) Persistent albuminuria.

Syphilis is included among the less common conditions, and the importance of specific treatment in certain obscure cases of persistent gastritis and relapsing ulcer urged.

HENRY GOODWIN WEBSTER.

A POCKET TEXT-BOOK OF ANATOMY. By WILLIAM H. ROCKWELL, JR., M.D., Assistant Demonstrator of Anatomy, College of Physicians, Columbia University, New York. Lea's Series of Pocket Text-Books. Edited by BERN B. GALLAUDET, M.D. Philadelphia and New York: Lea Brothers & Co.

The purpose of this book is to provide a reference handbook of anatomy. It is not complete enough for a text-book, and at the same time is too large for a compendium. Its usefulness therefore is limited, and will be found of service only to those who wish to make a fairly complete review of anatomy, and to whom the minutiae are not essential. There are comparatively few illustrations, and these are mostly taken from Gray's "Anatomy," which work has been closely followed by the author in compiling the present book. The manual might be improved by the addition of more illustrations and appropriate tables.

PAUL M. PILCHER.

COMPENDIUM DER OPERATIONS- UND VERBANDSTECHNIK. By
DR. EDWARD SONNENBURG and DR. RICHARD MUEHSAM.
Berlin: Verlag von August Hirschwald, 1903.

The present work is a hand-book of minor surgery. It takes up the preparation necessary for an operation, anæsthesia, the more elementary operations, the operative technique on the different tissue systems, and the general technique of dressings and bandaging. There are no novelties, and it is, in fact, an exposition of the methods in use at the Moabit Hospital, with occasional references to the methods of other surgeons. The illustrations are not elaborate, but are well chosen. The book is of interest to the American and English practitioner as presenting the ideas of German surgeons on this subject. The subject-matter is clear, concise, and up to date.

PAUL M. PILCHER.

CORRESPONDENCE.

"EXCLUSION OF ACTINIC RAYS OF LIGHT DURING OPERATION FOR GENERAL PERITONITIS."

EDITOR ANNALS OF SURGERY.

THE present knowledge of the action of the various components of light as a biodynamic factor is being gradually developed. The work of Finsen, Rutherford, the Curries, and others have opened up avenues for thought along strange and unexplored paths. The facts that present themselves in a glance at the more recent knowledge are somewhat startling. Diffused or concentrated sunlight is generally considered bactericidal in action. What do we know about the necessity for the presence of sunlight in the development of bacteria?

There is one type of infection—a streptococcus of the skin—which will not occur in the absence of sunlight or actinic rays. This is seen in smallpox, where the secondary pustular period will not develop if actinic rays be absolutely excluded from the patient.

The analogy between this condition and one about to be described is apparently as strong as between the curing of lupus and tubercular peritonitis by the action of sunlight. Finsen has shown that the pustulation of smallpox is due to the stimulation of the secondary streptococcic infection by actinic rays.

There come to most clinics cases of acute general peritonitis in which the symptoms of the patient are not at all in proportion to the actual condition present. These patients are seen forty-eight hours or more after the onset of the condition, and may show a pulse and temperature only slightly elevated above normal. What commonly happens when these patients are opened, washed, and drained? They promptly drop into a state of septic collapse

from which they do not rally. Does not the effect of operation in these cases suggest that we have stimulated in a terrific manner a severe infection?

Based on the analogy that seems to exist between these cases and smallpox, the suggestion is made that such cases should be operated in a clinic where the actinic rays of light are excluded.

This may be done by using only the illumination of red electric bulbs during operation and the total exclusion of all white light.

MARSHALL CLINTON, M.D.

BUFFALO, N. Y., February 7, 1903.

A TEST AS TO WHETHER THE CATHELIN URINE DIVISOR
FORMS A PERFECT SEPTUM IN THE BLAD-
DER OR NOT.

EDITOR ANNALS OF SURGERY.

ONE of the great difficulties in any of the divisors or segregators of the urine by mechanical means is to know whether the septum is perfectly reliable, *i.e.*, divides the bladder into two parts so accurately that the urines of the two kidneys do not commingle. I have recently had an experiment done in this direction which I think is conclusive. I lent the divisor of Cathelin to Dr. H. R. Loux, of the Jefferson Medical College Hospital, to try upon a patient, and suggested at the same time that he should make the following experiment: After adjusting the instrument, to inject some methylene blue through one of the small catheters into the bladder and see whether the urine from the opposite kidney remained clear or was discolored by the blue. As methylene blue is very diffusible and an extremely small leakage would show, I thought it would be a reliable test.

For certain reasons, Dr. Loux was obliged to continue the use of the instrument for an hour and three-quarters. He states that not until towards the end of this time was there the slightest discoloration of the urine from the opposite kidney, and then only

a very slight bluish discoloration. Moreover, the rubber septum which divides the bladder into two portions was markedly stained by the blue upon one side, and the other was perfectly clean when withdrawn from the bladder. So, too, of the two catheters,—one was blue, the other clean.

It seems to me that this experiment settles the question as to whether the septum is perfect or not. In a trabeculated bladder, of course, it would be difficult, and might be impossible to prevent leakage from one side to the other in consequence of the irregularity of the surface. I have had no experience as yet with such a bladder.

WILLIAM W. KEEN.

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No. 6

ORIGINAL MEMOIRS.

RESULTS OF ONE THOUSAND OPERATIONS FOR THE RADICAL CURE OF INGUINAL AND FEMORAL HERNIA PERFORMED BETWEEN 1891 AND 1902.¹

BY WILLIAM B. COLEY, M.D.,

OF NEW YORK,

Attending Surgeon to the General Memorial Hospital; Associate Surgeon to the Hospital
for Ruptured and Crippled.

FROM August, 1891, to May 11, 1903, I have operated upon 1075 cases of inguinal and femoral hernia.

Inasmuch as the purpose of this paper is chiefly to determine the permanent results of operation for the radical cure of hernia, I shall not consider the cases that have been operated upon during the last six months. This gives us 1003 cases operated upon during a period of eleven years prior to December, 1902. These cases may be classified as follows:

Inguinal hernia, 937 cases—756 male, 181 female.

Femoral hernia, 66 cases.

Of the inguinal cases there were performed in:

	Male.	Female.
1891.....	8 cases.	2 cases.
1892.....	20 “	2 “
1893.....	46 “	3 “
1894.....	71 “	6 “
1895.....	51 “	18 “

¹ Read before the American Surgical Association at Washington, May 13, 1903.

	Male.	Female
1896.....	50 cases.	20 cases.
1897.....	77 "	19 "
1898.....	71 "	22 "
1899.....	84 "	21 "
1900.....	100 "	30 "
1901.....	79 "	17 "
1902.....	99 "	21 "
	756 "	181 "

As regards the ages of the patients, 538 operations were performed at the Hospital for Ruptured and Crippled upon children varying in age from four to fourteen years. In 465 operations performed elsewhere, chiefly at the Post-Graduate and General Memorial Hospitals, the ages of the patients were as follows:

13 cases.....	1 to 4 years of age.
38 "	4 " 10 " " "
99 "	10 " 20 " " "
177 "	20 " 30 " " "
77 "	30 " 40 " " "
36 "	40 " 50 " " "
19 "	50 " 60 " " "
6 "	60 " 70 " " "
2 "	70 " " " "

Thus it will be seen that a larger proportion of the cases were children than adults. In 317 cases the patient was over twenty years of age (twenty to seventy) and in about 700 under twenty years.

The good results we have had in children at the Hospital for Ruptured and Crippled have frequently been explained on the theory that the radical cure of hernia in children is a much simpler matter than in adults, and that almost any method of operation will suffice. In answer to this argument, I would cite the fact that in twenty operations prior to 1890 in which the Czerny and Socin methods were used, 50 per cent. of relapses occurred within a year of the time of operation. The operation in children is really more difficult than in adults, and needs not only the best method, but the greatest care in

technique to give as good results as in the adult. With the best methods and the greatest care in the performance of the operation, I believe that the results in children are equal to the results in adults.

It will be readily admitted that children and young adults furnish better material for good results than individuals beyond middle life with weak and atrophied muscles. A comparison of my series of cases with the recent statistics of the Vienna Clinic ("End Results in 800 Operations for Hernia after the Method of Bassini in the Albert-Hochenegg Clinic," *Archiv für klinische Chirurgie*, Band lxxviii, Heft 1, 1902) will show a larger proportion of operations in elderly persons in mine.

At the Vienna Clinic, it is stated that 804 radical operations were performed upon 473 patients.—423 male, 50 female,—the ages of which were as follows:

1 to 5 years, 32; 5 to 10 years, 22; 10 to 20 years, 112; 20 to 30 years, 199; 30 to 40 years, 55; 40 to 50 years, 37; 50 to 60 years, 16 cases.

That 804 operations should have been performed upon 473 patients at the Vienna Clinic strikes one as peculiar in the undue proportion of double to single hernias. The explanation appears later in the text, and rests upon the custom that obtained at the Vienna Clinic, prior to 1898, of always operating upon both sides whenever any enlargement could be made out in the external ring of either side. This, as the records show, resulted in a double operation in nearly every case, whether a hernia was actually present or not. Hence the results of their 804 operations cannot be fairly compared with the results of other operators who have followed the usual custom of operating only upon actual rather than potential hernias.

My own list of 1003 operations shows only ninety-two double herniæ, or 911 individual patients operated upon.

As regards the methods employed in the femoral cases, Bassini's method for femoral hernia and the purse-string suture (with kangaroo tendon) were used,—the former in

sixteen, the latter in fifty cases. In the fifty cases operated upon by the purse-string method, there has not been a single relapse.

These cases have been in no way selected, and the purse-string method was employed in every patient, no matter how large the hernia.

Inguinal Hernia in the Female.—One hundred and eighty-one operations were performed for inguinal hernia in the female, with no mortality and without a single relapse. The method employed was practically Bassini's method for the male. The sac was always carefully dissected off from the round ligament (Fig. 1), and the latter was then allowed to drop back in the lower angle of the wound, and to lie beneath the deep layer formed by uniting the internal oblique muscle to Poupart's ligament. The aponeurosis is then closed over this deep layer with a continuous suture of kangaroo tendon and the skin with interrupted catgut. That the more complicated technique of cutting up the internal oblique and transplanting the round ligament into the upper angle of the incision, employed by Bloodgood and Kelly, and practically an application of the original Halsted operation for the male to the female, is unnecessary, is proven by the perfect results obtained by the simpler technique described. This operation can be easily performed in from ten to twelve minutes, and I have done it in eight minutes.

Including the cases operated upon from January, 1903, to April, 1903, I have operated upon 200 cases of inguinal hernia in the female, without mortality and without any relapses. This I believe is the largest number of this variety of hernia that has been reported. At the Vienna Clinic, Goldsen reports only seventy-one cases of inguinal in the female, with three relapses, and Championnière has reported seventy cases, with three relapses. Championnière removes the round ligament with the sac. This undoubtedly renders the operation much easier, yet, with a little care, the sac may be dissected off and the ligament preserved (Fig. 2).

Femoral Hernia.—In this group are sixty-seven cases

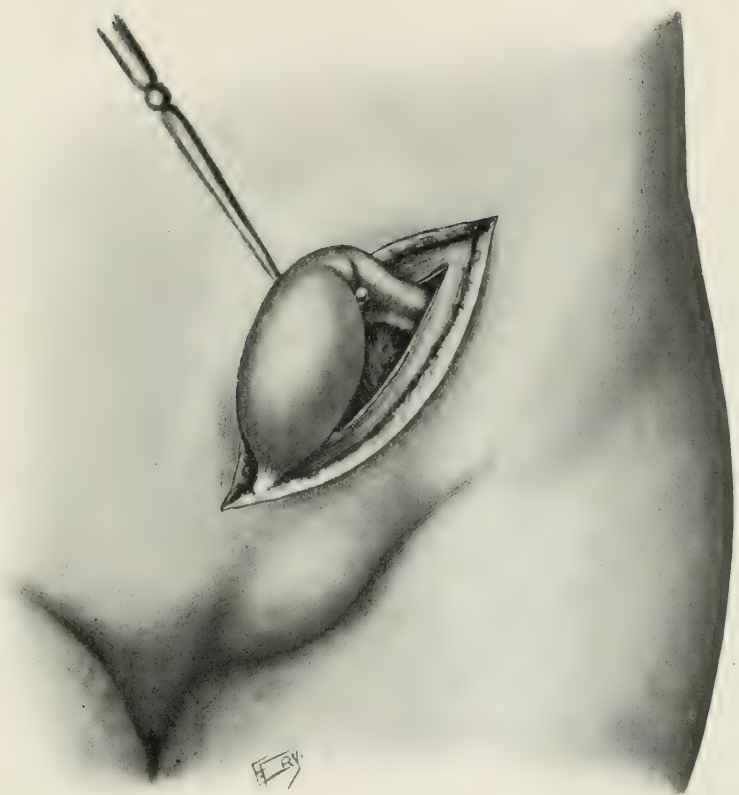


FIG. 1.—Inguinal hernia in female. Sac unopened.

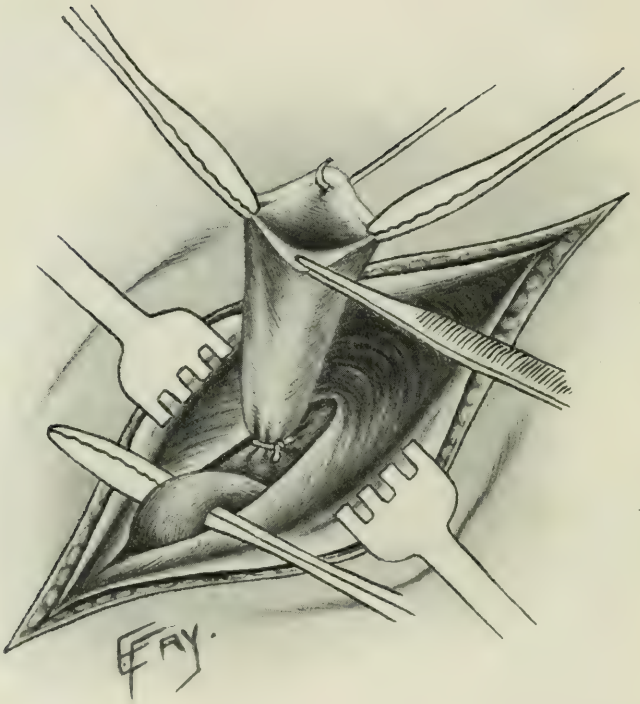


FIG. 2.—Inguinal hernia in female, showing sac dissected from round ligament.

operated upon from 1892 to 1902, with the following results: There was no mortality, and primary union was obtained in all but one case. This case furnished the only relapse that has been observed.

The patient, a woman aged thirty-five years, was operated upon in 1896 by Bassini's method for femoral hernia. At the end of one and one-half years there was a slight relapse, for which a truss was worn for a short time and then discarded. Five years later she wore no truss, and there was little more than an exaggerated impulse.

The other cases have remained sound, and all but eight have been traced, as follows:

Well from 10 to 11 years.....	1 case.
" " 8 to 9 "	4 cases.
" " 7 to 8 "	2 "
" " 6 to 7 "	1 case.
" " 5 to 6 "	7 cases.
" " 4 to 5 "	3 "
" " 3 to 4 "	2 "
" " 2 to 3 "	14 "
" " 1 to 2 "	12 "
" " 6 months to 1 year.....	3 "
" less than 6 months.....	7 "
Not traced	9 "
Relapsed	1 case.
Total	66 cases.

Thus it will be seen that forty-six were well from one to ten years and thirty-four from two to ten years after operation.

Direct Hernia.—Fourteen operations upon nine patients were performed for direct inguinal hernia. This is about the same proportion as shown in Goldner's statistics, twelve cases in 804 operations. In most cases I transplanted the cord by Bassini's method; but the very conditions that make it possible for a direct hernia to occur, viz., an abnormally poor development of the internal oblique muscle, make it difficult to effect a satisfactory closure of the opening by any method. This is

the class of cases in which Bloodgood finds "obliteration of the conjoined tendon," and advises utilizing the rectus muscle in closing the opening. As far as I have been able to trace the results, there has been but one recurrence in these fourteen operations for direct hernia.

END RESULTS IN 1003 CASES OF INGUINAL AND FEMORAL
HERNIA OPERATED UPON FROM AUGUST, 1901, TO
DECEMBER 31, 1902.

Of 937 cases of inguinal hernia the cord was transplanted according to Bassini's method with kangaroo tendon for the buried sutures in 917 cases, with ten relapses, or a fraction over 1 per cent.* Of these cases 181 were inguinal herniæ in the female, without a single relapse. In twenty cases in which the cord was not transplanted, six relapses have been observed. This does not give a fair idea of the relative value of the method of not transplanting the cord, for the reason that in several of the cases it was used in sliding hernia of the cæcum, a variety of hernia very difficult to cure by any method.

In sixty-six cases of femoral hernia there was one relapse, which was so slight that five years afterwards there was only a slight impulse that did not need a truss.

The purse-string method, originally described, I think, by Dr. H. L. Cushing, of Boston, was used in fifty cases with no relapse, and the Bassini method for femoral hernia in sixteen cases with one relapse.

End Results in Detail.—In the entire series of cases, 1003 in number, the end results were as follows:

Six hundred and forty-seven were traced and found well from one to eleven years; 705 cases were well from six months to eleven years; 460 were well from two to eleven years. The duration of observation in these cases was as follows:

* Since writing this paper, I have found one more relapse occurring in a large direct hernia, making the total number of relapses, after Bassini method, eleven.

Sound over 11 years.....	1 case.
" from 10 to 11 years.....	6 cases.
" " 9 to 10 "	12 "
" " 8 to 9 "	22 "
" " 7 to 8 "	19 "
" " 6 to 7 "	29 "
" " 5 to 6 "	48 "
" " 4 to 5 "	76 "
" " 3 to 4 "	97 "
" " 2 to 3 "	158 "
" " 1 to 2 "	187 "
" " 6 months to 1 year.....	58 "
Total	705 "

In comparing these results with recent statistics, it will be seen that the period of observation is considerably longer.

The statistics of the Johns Hopkins Hospital (*Bloodgood, loc. cit.*) show that of 268 cases operated upon by the Halsted method, only nine cases were traced more than six years, and only 124 were traced beyond one year.

The recent statistics at Czerny's Clinic (*Beiträge zur klinischen Chirurgie*, Band xxxiv, 1902, page 450) show that of 107 Bassini operations, nine cases only were well over six years and 106 cases over two years.

The statistics of the Vienna Clinic (Albert and Hochenegg) reported by Goldner (*Archiv für klinische Chirurgie*, Band lxxviii, No. 1, 1902) show that of 804 Bassini operations performed from March, 1895, to December, 1899, no cases were traced beyond six and one-half years; twenty-six were well from six to six and one-half years, and 434 from two to six and one-half years.

At the Vienna Clinic, thirty-one relapses were observed in 701 operations for inguinal hernia in the male, and four in seventy-one inguinal hernia in the female, or $7\frac{1}{2}$ per cent. Of fifty-eight cases of children, between the ages of one to ten years, there was one relapse.

The Johns Hopkins statistics (*loc. cit.*) show that in 268 cases operated upon by the Halsted method, there were six relapses and four others in which there was slight weakness in

the scar. Of thirty-nine cases of inguinal hernia in the female, there was one relapse. This gives 307 cases of inguinal hernia with seven relapses, or, including the four cases of weak cicatrices as relapses (which was done in Goldner's statistics as well as my own), eleven relapses, or 3.6 per cent.

As I have stated, the results at the Vienna Clinic cannot fairly be cited in comparison with other statistics, for the reason that they include a very large number of operations in which no hernia was present. Eight hundred and four operations were performed upon 473 patients. My own statistics show 1003 operations upon 911 patients, giving a double operation in only ninety-two patients, and then only when a hernia was actually present. Up to the end of 1898, or all except one year of the entire period covered by the Vienna statistics, it was the custom to operate on both sides "in all cases in which there was a widening of the external ring." The reason for this procedure was the fear that a hernia would develop on the other side, but the after-examination of fifty-two cases operated on unilaterally showing only four cases of hernia on the opposite side, the double operation was abandoned in 1899, except in cases in which a double hernia was present.

In order to estimate the percentage of radical cures after operation, it is necessary to know the period of time that must elapse before the hernia can reasonably be considered cured.

In former papers I have stated that by far the greatest proportion of relapses occur within the first year after operation, and that most of them occur within the first six months. This opinion was based on an analysis of 365 cases of relapsed hernia observed in the out-door department of the Hospital for Ruptured and Crippled and operated upon by various methods. This series of cases showed that 85 per cent. of the relapses occurred within the first year following operation, and that 65 per cent. occurred within the first six months. I have recently, with the help of Dr. George C. Warren, late House Surgeon of the Hospital for Ruptured and Crippled, made a study of 165 new cases of relapse observed since the previous statistics were compiled. This series shows that in twenty-

six cases the interval between operation and relapse was not definitely known, leaving 139 cases as a basis of calculation. It was found that ninety-one, or 65 per cent., relapsed within the first six months, and 111, or 80 per cent., within the first year after operation. Thirteen and two-thirds per cent. occurred from one to two years after operation, and only $6\frac{2}{3}$ per cent. occurred after two years had elapsed.

These new statistics quite confirm the conclusion drawn from the earlier cases, and prove that patients well one year after operation may reasonably be expected to remain well, and that after two years they may be considered permanently cured.

A Study of the Relapsed Cases.—An analysis of the relapsed cases shows that Bassini's operation had been performed in ten cases, which, in 917 Bassini operations, gives slightly more than 1 per cent. of relapses after this method. There has been one relapse in femoral and six relapses in twenty cases of inguinal hernia in which the cord was not transplanted. Looking into the cases individually, we find a special reason for the relapse in most instances. The Bassini relapses were as follows:

CASE I.—C. R., aged thirteen years. Very large, right inguinal hernia, the size of a fist. Operation, December 28, 1891. Silk used for buried sutures. This was one of the first cases in which I had employed Bassini's method; the technique was far from perfect, the dissection difficult, and operation prolonged. The wound suppurated badly and most of the silk sutures were extruded. Relapse occurred within three months.

CASE II.—I. M., aged seventeen years, was operated upon for large right inguinal hernia on May 25, 1894. Primary wound healing; remained well for over four years. Did hard riding as a cavalryman in army in Spanish-American war; contracted typhoid fever and lost over fifty pounds in weight; relapse occurred on getting up from typhoid in weakened, emaciated condition. I again operated on April 30, 1901, by Bassini's method, but a slight relapse occurred six months later.

CASE III.—A. B., aged thirty-five years, butcher, operated

upon for large inguinoperineal hernia, July 1, 1896. Primary wound healing. Patient had a large abdomen with a good deal of fat in abdominal wall. Occupation required heavy lifting. Very slight relapse (size of a pigeon's egg) one year later. Truss worn for a short time. Examination four years later showed only exaggerated impulse on coughing.

CASE IV.—O. S., aged twenty-three years. Large R. O. I. H. Operation, September 7, 1898. Prolonged, deep suppuration (*staphylococcus pyogenes*), with giving way of aponeurotic layer of suture. Relapsed one and one-half years later.

CASE V.—P. M., aged twenty years. Operation, February, 1895. Primary wound healing. Remained well for two and one-half years, when he received a severe kick in the groin, over cicatrix of hernia wound, during a fight. A protrusion was noticed almost immediately afterwards. The relapse was slight and did not enter scrotum.

CASE VI.—J. B., aged twenty-seven years. Large right inguinal hernia, eight years' duration, with adherent, irreducible omentum. Operation, July 1, 1897. Bassini; kangaroo tendon; primary wound healing. Very slight relapse fifteen months after operation.

CASE VII.—F. N., aged fifty-seven years. Right direct inguinal hernia with large opening and very poorly developed internal oblique muscles. Cord transplanted, but closure of canal unsatisfactory. Primary wound healing. Patient developed albuminuria shortly after operation, and general condition became much below par. Slight relapse followed about three months after operation and truss was applied.

CASE VIII.—I. G. R., aged forty-nine years. Left oblique inguinal-scrotal hernia. Operation, February 7, 1900. Primary wound healing. Relapse the size of an egg, just outside external ring, two years after operation.

CASE IX.—I. W., aged nine years. Double inguinal hernia, complicated with double reducible hydrocele. Operation, August 7, 1894. Double Bassini operation, kangaroo tendon. Primary wound healing. Eleven months later, relapse, the size of a marble, on right side; truss applied. March, 1898, no sign of relapse. March, 1903, slight protrusion.

RELAPSES IN CASES IN WHICH THE CORD WAS NOT
TRANSPLANTED.

CASE I.—W. I. S., aged twenty-nine years. Double inguinal hernia, scrotal. Operation, September 5, 1891, at Post-Graduate Hospital. Bassini's method was used on right side and the cord was not transplanted on the left side. Silk was used for buried sutures. The wound healed by primary union. The rupture remained cured for nine years, when the left side relapsed. I operated on side again, April 24, 1901, at the General Memorial Hospital. The right side (Bassini) was still perfectly sound nine and one-half years after operation, and remains sound at present,—more than eleven years.

CASE II.—V. S., aged nine years. Right inguinal hernia of four years' duration. Truss treatment inefficient. Operation at the Hospital for Ruptured and Crippled in January, 1892. Suture of canal without transplanting cord. *Buried silk sutures*. Wound healed apparently by primary union; but about two weeks later a small sinus was found and some of the buried sutures were extruded. Relapse three months after operation. Second operation by Bassini's method with kangaroo tendon in July, 1902. Patient perfectly sound ten years later.

CASE III.—F. H., aged ten years. Left inguinal hernia, congenital, complicated with hydrocele of cord. Operation, February 15, 1892. Suture of canal with chromicized catgut. Cord not transplanted. Primary wound healing. Slight relapse in canal three and one-half years after operation. Second operation, October 4, 1895. Bassini's method, kangaroo tendon. Slight stitch-hole abscess. Patient has remained well since last operation.

CASE IV.—H. O., aged eight years. Right oblique, inguinal hernia. Operation at the Hospital for Ruptured and Crippled, December 12, 1891. Suture of canal with catgut. Cord not transplanted. Primary wound healing. Slight relapse three months after operation. Patient wore a truss for a short time, and examination, November 18, 1895, four years later, showed the hernia practically cured, only an impulse on coughing remaining.

CASE V.—C. H., aged thirty years. Sliding cæcal and appendicular hernia, large scrotal. The hernia had existed since infancy, and could not be held by truss. Operation, July 22, 1900. The patient had previously been under the "Miller Injection"

treatment, and had had fifteen injections of irritating fluid made into the tissues about the sac. The cæcum, appendix, and a large mass of irreducible and highly vascular omentum were found in the sac. The omentum and appendix were excised and the sac sutured as well as is possible in a sliding hernia of the cæcum. The posterior portion of the cæcum was devoid of peritoneal covering. The cæcum was pushed back and the canal sutured with kangaroo tendon without transplanting the cord. The wound healed by primary union, and the patient left the hospital in three weeks. The hernia relapsed about three months after operation.

CASE VI.—H. D., aged four years. Right inguinal, large cæcal sliding hernia. First operation at the New York Hospital six months before; wound suppurated badly and healed by granulation. Recurrence soon after leaving hospital. The cæcum had slid down into the scrotum. Dissection very difficult. No distinct sac. Closure of canal very unsatisfactory. Slight relapse follows six months later.

Technique Employed.—In operations for inguinal hernia in the male, I have tried to follow Bassini's technique as closely as possible, except that I have substituted an absorbable suture for silk. I have also in nearly every case placed a suture above the cord to prevent any widening of the new internal ring in an upward direction. After the sac has been tied off well beyond the neck, at a point where it has begun to widen out into the general peritoneal cavity, the deep layer of sutures is placed as follows: With a small tape the cord is held up and the first suture is placed so that it just touches the lower border of the cord when the latter is brought vertically to the plane of the abdomen; three to four more through the internal oblique and Poupart's ligament will suffice to close the canal to the symphysis pubis. Then the suture above the cord (Fig. 3) is inserted. This is not a part of Bassini's technique, but I believe it is of decided aid in preventing a relapse, as it strengthens the only weak point in the operation. The incision in the aponeurosis is then closed from above downward by a small continuous suture of kangaroo tendon and the skin with catgut. No drainage is used, and the wound is dressed very

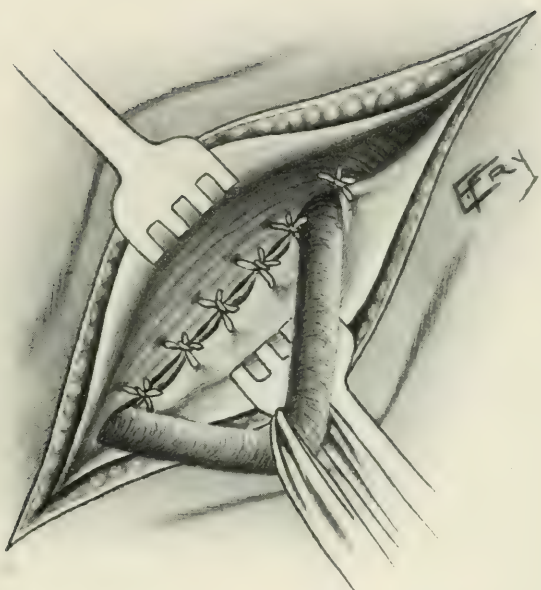


FIG. 3.—Bassini's operation (deep sutures), showing extra suture above the cord.

carefully with 10 per cent. iodoform gauze and, lastly, dry gauze and cotton and spica bandage. A plaster spica is used in children under fourteen years of age. The wound is dressed the seventh day, and the patients are kept in bed two weeks and allowed to go out in two and one-half to three weeks, wearing a spica bandage until four weeks have elapsed, after which no support is worn.

Suture Material.—I have long been a firm believer in the superiority of absorbable to non-absorbable sutures in operations for the radical cure of hernia. I have already in former papers called attention to the disadvantages of silk, silver wire, and silkworm gut, and I will state that increased experience confirms the opinion that these disadvantages are very real. It is true that, under strict aseptic conditions and perfect technique, non-absorbable sutures seldom cause trouble, yet that they do cause trouble in a certain proportion of cases is a demonstrated fact. The late sinus formation with or without extrusion of the sutures tends to weaken the canal and predisposes to relapse. Catgut was used by Czerny in hernia operations prior to 1880, but was soon given up for silk, for the reason that it was believed impossible to perfectly sterilize catgut. By modern methods of sterilization, catgut and kangaroo tendon can be rendered absolutely sterile, and hence the only real objection to their use has ceased to exist. Yet, we find the old prejudice against them still existing almost universally in Europe and very generally in this country. Silk is still used by Bassini for buried sutures and also at the Vienna Clinic, as seen from the statistics referred to.

Silk, silver wire, and recently silk again, have been used at the John Hopkins Hospital.

In proof of the opinion that a large proportion of the cases of suppuration formerly attributed to catgut or imperfectly sterilized buried sutures was really due to other causes, chiefly to infection by the hands of the operator or assistants, it is only necessary to compare the results of wound healing before and after the use of rubber gloves.

Of 116 cases operated on at the Johns Hopkins Hospital

prior to 1896, when gloves were not worn, there were twenty-eight suppurations (24.13 per cent.). Of 104 cases closed with silver wire (without gloves) there were ten cases of suppuration or 9.6 per cent.; while in 226 cases closed with silver wire, with gloves, there were only four cases of suppuration, 1.7 per cent. It may be taken for granted that the suture material, both silk and silver wire in these cases, was always sterile, and that the main causes for the great improvement were due to the use of the rubber gloves.

That improved technique and greater facility in performing the operation may alone cause marked improvement in wound healing, the statistics of the Vienna Clinic prove. While the average percentage of suppuration in the 804 operations was 14.5 per cent., the percentage in 1895 (when the operation was first done) was 18 per cent., while in 1899, without gloves and with the same sutures (silk), the percentage of suppuration was only 5.8 per cent.

That quite as perfect wound healing may be obtained with absorbable sutures and ligatures (kangaroo tendon and catgut) as has ever been obtained with silk or even silver wire, my own statistics prove.

The sutures used have been prepared by Van Horn & Co., of New York, originally by boiling in alcohol under pressure, and the last six years by the Cumol method, and preserved in absolute alcohol. The kangaroo tendon is chromicized just sufficiently to remain unabsorbed for about four weeks, but not long enough to cause the suture to act as an irritating foreign body and produce sinuses.

Rapidity in operating, clean dissection, especially in the separation of the sac from the cord, without bruising the tissues or allowing them to become infiltrated with blood, are also important factors in securing primary wound healing. This is well shown by two operations performed by one of my house surgeons. Though rubber gloves were worn by himself as well as his assistants, because of difficulties with the sac the operation was prolonged, and the tissues were bruised and blood-stained. Both wounds suppurated.

Wound Healing, Personal Cases.—In 1003 operations for inguinal and femoral hernia, in thirty cases there was suppuration. In twenty-one this was limited to stitch-hole abscess, and in nine cases there was deep suppuration. Prior to March, 1899, when I began to use rubber gloves for my assistants and gloves or cots for myself, there were twenty-five cases of suppuration, or 4.2 per cent. Since the use of rubber gloves there have been only five cases of suppuration (one deep and four superficial) in four years, in about 400 cases, or $1\frac{1}{4}$ per cent.

An analysis of the cases of suppuration shows that twenty occurred in 700 cases under the age of twenty and ten occurred in 300 cases over the age of twenty, thus giving practically the same percentage of primary union in the children as in the adults. The largest number of cases in which suppuration occurred were observed in the year 1898, while since November, 1900, I have operated upon 170 cases of adults without a single case of suppuration.

Indication for Operation.—There are certain general rules that have been observed as a guide to operation in the cases reported:

1. *Operation for Hernia in Children.*—Operation is seldom advised under the age of four years except in strangulated cases. The reason for this rule is that many of these cases, probably two-thirds, are cured by a truss. After the age of four years, in all cases in which a truss has been tried and failed, or cases in which the presence of reducible hydrocele prevents a truss from holding the rupture, operation is advised. The same rules hold good in irreducible omentum, a rare condition in childhood.

2. *Operation for Hernia in Adults.*—In all adult cases under the age of fifty years, unless there are strong contraindications present, operation is advised. Between the age of fifty and seventy years operation is advised in patients in good health, in cases in which the rupture is held with difficulty by a truss.

Among contraindications to operation I would mention (1) serious organic trouble of the heart, lungs, or kidneys;

(2) very large, adherent, irreducible hernia in stout individuals, especially when the sac contains both intestine and omentum.

I believe the risks of operation in such cases are large and the chances of a permanent cure small.

When omentum alone is present, the danger is less, but is still enough to be worthy of consideration. I have operated in a single month upon three patients, all weighing 240 to 250 pounds, with irreducible omentum necessitating resection of large masses. All healed by primary union without drainage, yet one case, a man fifty-five years of age, in which a very large mass of omentum had been removed, illustrates the dangers attending operation under these conditions.

Two weeks after perfect primary union, a tender, painful area developed near the umbilicus, and the pulse and temperature began to rise. This continued for a week. Temperature, 99.5° F., A.M., and 101° to 102° F., P.M., and the leucocytic count rose to 20,400. An incision was made under ether on the tenth day after the trouble was first noticed, and the omental stump was found firmly adherent to the anterior parietal peritoneum. On cutting into the inflamed omentum about three-fourths of an inch, an abscess the size of an egg was found and evacuated. Free drainage was established and the wound slowly healed by granulation. If the condition had not been recognized and dealt with at the proper time (neither too early nor too late), peritonitis would probably have ensued.

There has been one death observed in the New York Hospital from the rupture of an abscess in omental stump (tied off *en masse* with silk), and Dr. Bull has reported three cases of well-marked inflammatory swelling in abdomen following ligature of omentum *en masse*, but in no case was there abscess formation. In my own case the omentum was tied off in small masses with catgut, and the greatest care was exercised. I believe the suppuration due to fatty necrosis of the stump, which, in a person of more vigorous vitality, would have caused no trouble. Gloves were worn by the operator and assistants.

Mortality.—There have been two deaths in my series of

1003 cases, or up to May 11, 1903, two deaths in 1075 cases, a mortality of less than one-fifth of one per cent.

My first death (111th case) was due to ether pneumonia in a child aged six years. The second death, February, 1898, was in an adult with large irreducible omental hernia. The omentum was returned instead of being excised (as is my custom when down for any length of time and difficult to reduce). The patient developed intestinal obstruction, whether due to a volvulus or to a slowly progressing peritonitis, could not be ascertained, and died on the sixth day in spite of a second operation. Since that time over 500 operations were performed without a death. The mortality of operations for the radical cure of hernia has been steadily reduced during the past decade. Prior to 1890 it was not far from 6 per cent., which showed sufficient risk to make one hesitate to advise operation as a routine measure.

At the Vienna Clinic there were only three deaths in 804 operations,—one in narcosis, two others, eleven and fourteen days respectively, after operation. One was due to pulmonary embolism, the other to embolism associated with varicosities in the subcutaneous connective tissue of the right thigh, with formation of thrombi in the varices.

At the Johns Hopkins there was but one death in 459 cases, and at Carle's Clinic in Rome there were but two deaths in 1400 operations upon 1285 patients, one from pneumonia on the seventh day of operation.

These statistics prove that the risk of operation for hernia at present (at least in skilled hands) is practically *nil*, and certainly less than the risks of strangulation, even with a hernia apparently well held by a truss.

SPECIAL VARIETIES.

Hernia associated with Undescended Testis.—In 49,859 cases of hernia observed at the Hospital for Ruptured and Crippled from 1891 to 1902, there were 400 cases of hernia with undescended testis.

Personally, I have operated upon thirty-eight patients with hernia associated with undescended testis.

The age of these patients ranged between four and thirty years. Twenty-seven were under fourteen years and eleven between fifteen and thirty years of age.

In only one case did I find it necessary or did I deem it wise to remove the testis. This was in the case of an adult aged twenty-three years. The testis was entirely within the abdominal cavity when the patient was lying down, yet on standing or coughing the testis could be forced into the canal.

Operation showed this peculiar, and in my experience unique, condition (Fig. 4).

A well developed hernial sac extended into the scrotum, and yet the testis could not be drawn down as far as the external ring, even with strong traction. The large cord with dilated veins projected fully two inches below the testis. This condition has been recently described by W. McAdam Eccles in his admirable and exhaustive lectures on "The Imperfectly Descended Testis" (*Lancet*, March 1 and 15, 1902). He states that "The explanation of the scrotal protrusion lies in the fact that a pouch of peritoneum is so frequently drawn down by the gubernaculum testis into the region of the scrotum beyond the site of the arrested organ."

The proper method of treating hernia associated with undescended testis is a question that is still unsettled. Some authorities advise removal of the organ on the ground that it is functionally of no value. Bloodgood's statistics of 459 cases of hernia operated upon at the Johns Hopkins Hospital, between 1889 and 1899, show that the cord was excised in twenty cases, and that in twenty-seven other cases castration with excision of both testis and cord was performed. The excision of the cord was done deliberately in fifteen cases,—in thirteen in men over fifty years of age and in three cases because the cord was accidentally cut during the operation. Castration was further performed in two children on account of injury to cord and in eight other cases on account of undescended testis with hernia. Double castration was per-

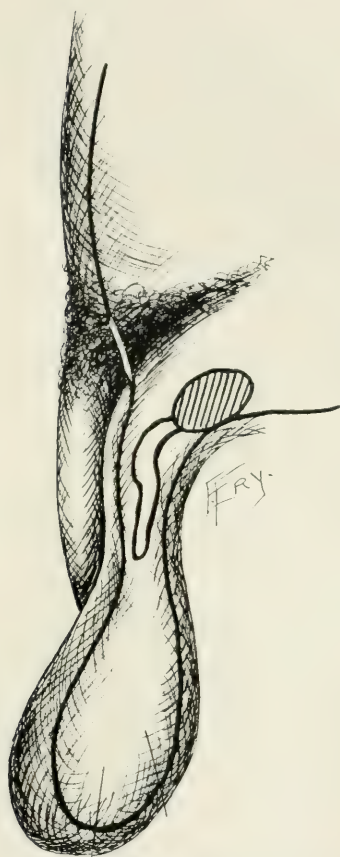


FIG. 4.—Congenital sac extending to bottom of scrotum, with testis within external ring.

formed only in one case in a man with double hernia associated with undescended testes. It is stated that the testes were functionless.

Bloodgood states that Dr. Halsted believes that these undeveloped testes are important in the economy of the male and should be preserved.

In cases of markedly atrophied testis, castration is never done at the Vienna Clinic, as experience has taught that an undeveloped testis, if fixed in the scrotum before puberty, may yet develop to its normal state.

Kraske performed castration in two cases in which the hernial sac could be isolated with difficulty only from the cord. Later, he justified his view by stating that where force is necessary to isolate the cord from the sac, necrosis of the scrotum will ensue.

Broca observed seventy-nine cases of orchidopexy from one to six years after operation. In one case he had to perform castration on account of continual pain; in thirteen atrophy set in; in one it was pretty certain that a recurrence had occurred; the remaining sixty-four developed normally.

Franz considers castration indicated only in cases of distinct atrophy. He reports three cases of castration in connection with radical operation for hernia. In one of these cases, semicastration for atrophy was done together with radical operation; in the second case, semicastration was performed, as the hernia had relapsed and the testis originally fixed to the perineum had become loose again. In the third case, Bassini's operation was performed with semicastration for periorchitis proliferans.

Eccles's careful study of this question (*loc. cit.*) strongly supports this opinion. His conclusions are "that whereas there may be found in the testis two distinct types of cells, the first needed for the formation of spermatozoa and the other probably, though it cannot be positively affirmed, required for the production of an internal secretion, failure in the development of both these types of cells will, as a rule, lead to failure in the proper bodily growth of the individual; but the develop-

ment of the interstitial cells, even though there are no sperm elements, will allow the possessor to become virile while remaining sterile."

Believing in the physiological value of even an atrophied and probably functionless testis, I have made it a practice always to preserve the organ, and have never removed it except on two occasions,—the one already referred to, and the other a small and greatly atrophied testis situated in the perineum and associated with a very large *inguinoperineal* hernia the size of a cocoanut. In both cases the patients were adults, and in both the other testis was fully developed.

I do not believe it wise to operate on the majority of herniæ with undescended testis in children under ten years of age, for the reason that in many cases, as the boy approaches puberty, the testis descends into the scrotum spontaneously. Formerly, I attempted to anchor the testis into the scrotum by various methods, but in recent years have abandoned such attempts. The testis can almost always be drawn outside the external ring, and if the canal is then closed by Bassini's method, the testis will not be able to get back into the canal, and in a fair proportion of cases it will later find its way to the scrotum. I have not observed a single recurrence of the hernia in these cases.

As to the danger of injuring the cord during operation, this can be avoided with reasonable care. I have never as yet met with this accident. The risk is much greater in children than in adults, as the vas is so small and delicate that it may be easily torn.

In discussing hernia associated with undescended testis, we may consider two rare varieties that owe their origin to maldescent of the testis. These are *Inguinoperineal Hernia* and *Inguinosuperficial Hernia*.

Inguinoperineal, or "superficial perineal," *Hernia*, as Küster and Eccles prefer to call it, to distinguish it from a hernia through the pelvic outlet. Its etiology is best explained by the presence of accessory fibres of the gubernaculum testis, which pass into the perineum and there terminate instead of at the bottom of the scrotum, as is usually the case.

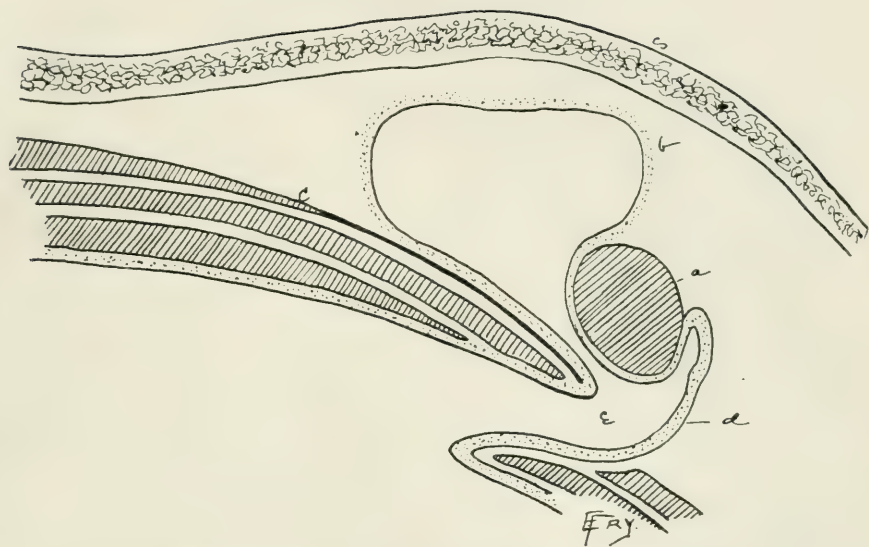


FIG. 5.—Inguinal superficial hernia. *a*, Testis; *b*, hernial sac; *c*, aponeurosis of external oblique; *d*, cord; *e*, external ring; *s*, skin.

This is one of the rarest varieties of hernia. Küster, in 1887 (*Archiv für klinische Chirurgie*, Band xxxiv, page 216), was able to find but three cases in the literature, and one of these was doubtful. In only one of these was an operation performed. It is always associated with perineal ectopia of the testis, itself extremely rare. Küster found only twenty instances of this condition in literature.

I have observed eight cases of testis in the perineum, and in six the condition was associated with a hernia. On five of these patients I operated for the cure of the hernia. The sac was in every case congenital, and in four instances I retained enough of the sac to cover the testis and placed the organ in a new pouch made in the empty scrotum; in three cases the testis remained in the scrotum, but in one it came out and slipped back into the anterior portion of the perineum. In one case only did I remove the testis, my first case, with a hernia the size of a cocoanut and a small atrophied testis at the bottom of the sac.

Superficial Inguinal Hernia, or hernia superficialis inguinalis, is characterized by the German writers. This is really a variety of interstitial hernia, and is so described by Macready and also by Eccles. Moschcowitz has recently described this variety (*Medical Record*, January 10, 1903) and reported a case. He states that only fifteen cases have been reported. That this variety is not nearly so rare as these figures would lead us to believe, my own statistics show.

I have operated upon five cases,—two in adults and three in children. The distinctive feature of the condition is that the sac and testis lie outside of and directly upon the aponeurosis of the external oblique muscle and just beneath the skin (Fig. 5). The origin of this form of hernia is probably due to the fact that the fibres of gubernaculum testis that usually terminate in the scrotum are absent or poorly developed, and the testis, having been pushed out of the narrow external ring by the hernia behind, meeting an obstruction to further progress downward, turns upward along the line of least resistance and rests upon the aponeurosis.

CASES OF INGUINOSUPERFICIAL HERNIA.

CASES I, II. *Double Superficial Inguinal Hernia*.—O. H., male, aged ten years. Testis never in scrotum. Had swelling in both inguinal regions for several years. Operation at the Hospital for Ruptured and Crippled, March 20, 1902, both sides. On both sides the sac and testis were found just beneath the skin and superficial fascia, resting upon the aponeurosis of the external oblique muscle. The testis occupied a position one and one-half to two inches above the external ring. The rings were rather small and the testis could not be reduced into the canals. A typical Bassini operation was performed, and the cord was of sufficient length on both sides to permit the testis to be brought into the bottom of the scrotum, when a pouch was made with the finger to receive them. The patient was examined six months later and the testis remained in the scrotum.

CASE III.—H. V. W., male, aged thirty years, a physician. Had never seen left testis in scrotum. He had observed a swelling in left groin, for which he had tried to wear a truss, but it was always so painful that he had been obliged to take it off. Operation, June 25, 1902. My notes of operation state that "testis and sac, emerging from the external ring, have turned upward and rest upon the aponeurosis of the external oblique." The testis was brought into the scrotum. The wound was closed by Bassini's method; primary union followed, but the patient has not been traced.

CASE IV.—S. S., male, aged twenty years. Double inguinal hernia with left undescended testis. The testis on the left side had never been in scrotum, but there had been a swelling in the inguinal region for some years. Had never worn a truss. Operation at the General Memorial Hospital, October 15, 1902. The testis with a large hernial sac was found one and one-half inches above the external ring and lying upon the external oblique aponeurosis.

Hernia of the Cæcum, Appendix, and Sigmoid.—Thirty-seven cases of these varieties were observed. Of these the cæcum was found alone in ten cases, the appendix was found in sixteen cases, the sigmoid was found in three cases (one strangulated), and in eight cases there was a sliding hernia of the

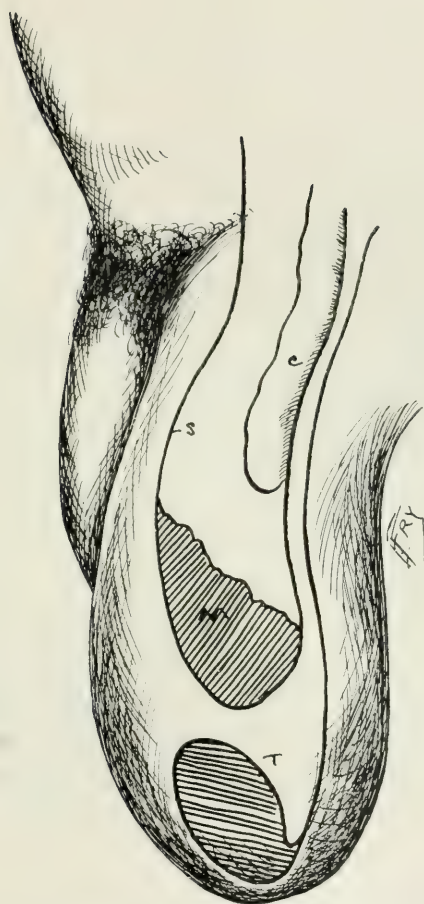


FIG. 6.—Sliding hernia of cæcum. *t*, Testis; *c*, cæcum; *s*, sac (acquired); *m*, hard, tuberculous looking mass at lower end of sac.

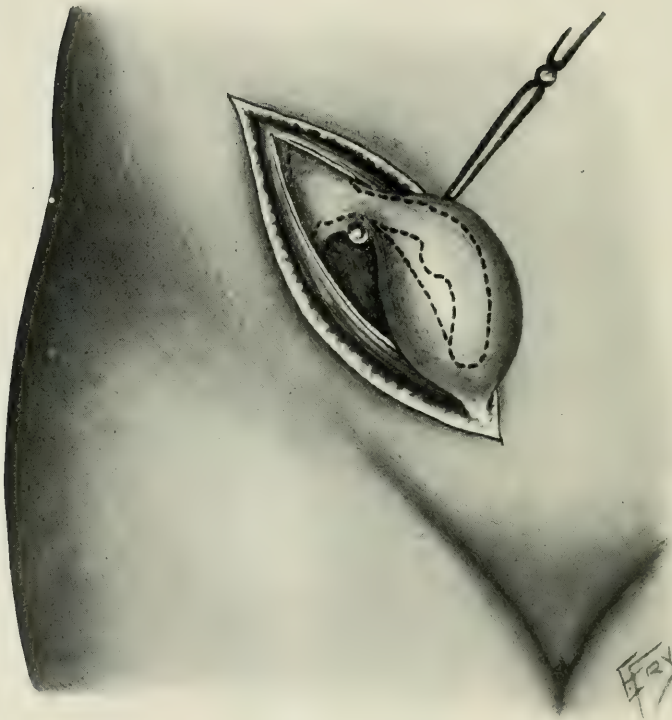


FIG. 7.—Incarcerated hernia of the appendix, with sac distended with bloody fluid.

cæcum, or "Hernie par Glissement," as described by the French writers. Of these eight cases the cæcum alone was present in six cases and the cæcum with the appendix in two cases. The following cuts (Figs. 6 and 7) will show the condition present in this form of hernia.

Cæcal and sigmoidal hernia are the most difficult of all varieties to deal with, either with mechanical or operative treatment, especially when of the sliding variety. It is often impossible to do a typical Bassini operation in these cases, and I have usually been content with closing the canal as carefully as possible without transplanting the cord.

Hernia of the Bladder.—I have personally operated upon one case of hernia of the bladder. The patient was a man forty-seven years of age. The hernia had existed for several years, and was hard to reduce and very painful when down. He had observed frequent micturition when the hernia was down. Operation was performed May 7, 1902. The bladder was not opened at operation, but was recognized in time. The patient was well January 8, 1903.

I have had two other cases of bladder hernia on my service at the General Memorial Hospital, but in both cases the operation was performed by my associate, Dr. William A. Downes.

Tubercular Hernia.—I have operated upon three cases of tuberculosis of the hernial sac, two children and one adult. In two cases the diagnosis was confirmed by the microscope, and in the other the clinical appearance was characteristic. In one case, a boy aged six years, an operation had been performed for a large left inguinal hernia with reducible hydrocele in September, 1900. Nothing unusual was noted in the appearance of the sac. A few months later he developed a hernia with fluid in the sac on the opposite side, and operation was performed on March 19, 1901. The sac was found studded with miliary tuberculosis, and examination by Dr. Jeffries, pathologist to the Hospital for Ruptured and Crippled, confirmed the diagnosis. The patient was well when last observed, eight months later. There were no signs of tuberculosis elsewhere.

A second case occurred in a femoral hernia in a young woman aged twenty-three years. In this case there were signs of tuberculous disease in the lungs.

Strangulated Hernia.—I have operated upon seventeen cases of strangulated inguinal and femoral hernia with two deaths, one death occurred in a case of femoral hernia strangulated for three days, and in which I was obliged to resect seven inches of intestine. The other was in an infant six weeks old with a strangulated cæcum and appendicular hernia of three days' duration. The child was nearly moribund at the time of operation. In the remaining fifteen cases a radical operation (mostly by Bassini's method) was performed, and there has not been a single relapse. Primary wound healing occurred in every case. In nine cases the patient was under the age of two years and in eight under one year, the youngest being an infant aged thirteen days with a hernia strangulated fourteen hours. The patient left the hospital at the end of three days, and the hernia remains well more than a year after operation. It is important to note that in every case the strangulation was not caused by the neck of the sac, as is stated by most writers, but by the tense external abdominal ring.

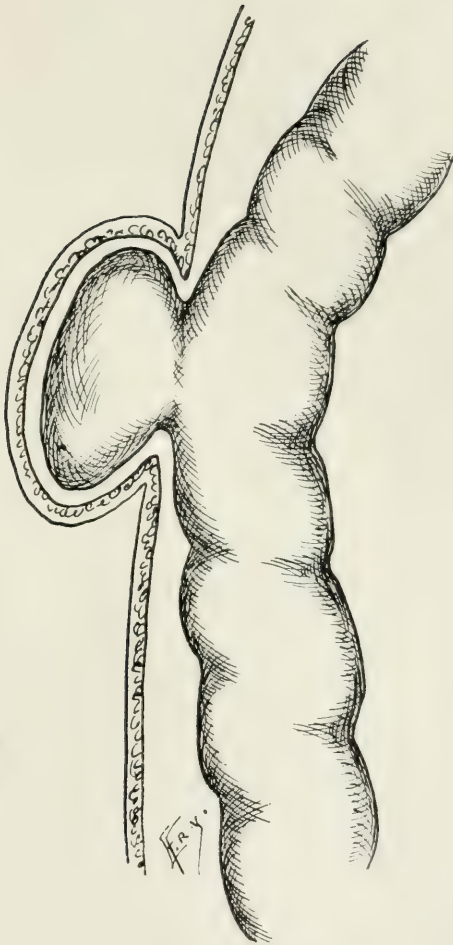


FIG. 8.—Strangulated properineal Richter's hernia. (Partial enterocele.)

MYOSITIS OSSIFICANS.¹

WITH A REPORT OF TWO CASES,—ONE TRAUMATIC, THE OTHER NON-TRAUMATIC.

BY WILLIAM J. TAYLOR, M.D.,
OF PHILADELPHIA.

ALTHOUGH knowledge concerning the etiology of “myositis ossificans” is obscure, there have been enough cases recorded to establish it as a definite condition; but we are still very uncertain as to its cause. There are two great classes. The first those where bone has formed in the softer tissues, with or without history of injury, and in which no connection can be found apparently with the bones of the skeleton or their periosteum; and again, in others there may be osteophytes to which muscle tissue is attached and which has undergone osseous change.

The second is where there is a formation of new bone resulting directly from an accident to bone or its periosteum and involving the muscles and fibrous structures. All these conditions are found in youth. Those of the first class are characterized by local swelling, and, later, loss of function, with gradual ossification of the muscle. This is the most common. A number of cases have been reported under the second heading, in which the muscles become ossified quickly after a single injury, generally, as in my own case, following the kick of a horse, and, as in F. Munro’s case, from an injury to the thigh received in a foot-ball game. (F. Munro, *Lancet*. February 21, 1891, p. 427.)

In Munro’s case, a young man of twenty-four received a blow on the right thigh while playing foot-ball. He was incapacitated from work for three days. A week after the accident he noticed a hard swelling an inch and a half above the outer side of

¹ Read before the Philadelphia Academy of Surgery, March 2, 1903.

the knee-joint. This got larger, and five weeks after the accident he sought medical advice. On examination, there was found what seemed to be a lump of bone lying loose in the muscle of the outer side of the thigh. It was about eight inches long, narrow, and projecting at its lower end and approaching the surface, but broadening out as it passed up the thigh and lying more in the muscles. It was slightly movable except at its upper end. The patient could walk about fairly well with the assistance of a stick, but was able to flex his thigh only very slightly. After about two weeks an incision three inches long was made over the projecting portion, and in the substance of the vastus externus was a mass which had to be removed with bone forceps. There were no complications, and the patient left the hospital well in the course of a few weeks.

Mr. Bilton Pollard (*Lancet*, December 31, 1892, p. 1491) reports a case of "myositis ossificans" in a boy of nine, where a large number of the muscles became ossified without there being any particular injury to account for it. An operation was performed and the teres major muscle was exposed. The bone was found to occupy the substance of the muscle in nearly its whole extent.

Dr. F. W. Burton-Fanning (*Lancet*, September 28, 1901, p. 849) reports a case of a man aged thirty-three, who at the age of eight years had gradual stiffening of the left shoulder without previous injury or pain. At the age of twelve the right knee became impaired until all power of motion had gone. Following this in order came stiffness of the left hip, sides of chest, and lower part of back. At the age of twenty-eight the right arm from the shoulders downward was much swollen, the skin being red and tender. The inflammation was so acute that the arm was thought to be poisoned, but the swelling gradually passed off, and the arm was found to be flexed in the extended position, while the movements of the shoulder previously impaired were diminished. Flexion and extension remained at the wrist, but the forearm could only be supinated through half the natural extent. Two years later stiffness of the right hip was noticed, and this gradually extended until the legs became affected and the patient had numerous falls, but he had never seriously hurt himself, and could not attribute an increase of his malady directly to any injury. He was remarkably free from any other disease.

There was a family history of his father having had "myositis ossificans," and dying at the age of thirty-three from an accident.

Mr. Charles Stonham (*Lancet*, December 31, 1892, p. 1485) speaks of the causation of the disease as being shrouded in obscurity, but that it is essentially one of early life. While heredity is supposed to be a large factor, there are comparatively few in which this can be traced. Most of the cases of "myositis ossificans" cannot be directly traced to any trauma, and there is a history resembling in large part muscular rheumatism; in the cases which he reports and the illustrations which he gives, there seems to be an overgrowth of the bony tissues and the formation of osteomata and osteophytes, as well as ossification of certain of the muscles.

In the illustrations which he gives, the osseous formations are many of them independent of the skeleton, but in some parts they are attached to it, spreading into the muscular insertions as pointed, stalactite-like masses. True spongy exostoses may also be met with. Usually in the form of flattened, perforated plates, the bony tissue may be in nodular masses or sharp and pointed.

He appends a large number of references to cases in English, American, and Continental journals.

Dr. Lydia M. Dewitt (in *The American Journal of Medical Sciences*, September, 1900, p. 295) published a very elaborate pathological report from two cases of "myositis ossificans."

The first case resulted from chronic inflammation (possibly tuberculous), in which ossified masses were found immediately surrounding the femoral vessels, and extending in all directions between the degenerating and regenerating muscle-fibres.

The second case resulted from an injury to bone,—a fracture of the thigh,—which may have injured also the muscles and other soft parts.

Munro (*Lancet*, February 21, 1891, p. 427) speaks of

"myositis ossificans" as a result of chronic inflammation either localized or general. In the localized variety the inflammation of the connective tissue is usually the result of repeated slight injuries, the bony tumor in one case appearing five weeks after the injury.

Heredity, although claimed by many writers to be a factor in the causation of the disease, does not seem to play any large rôle in its production, although there are a few cases where it would seem to be operative.

Treatment in the non-traumatic variety has been of little avail in the majority of cases; excision of the muscles doing little or no good, as the ossification of some of the degenerated muscles has very soon taken place.

In Dr. Keen's case, reported in the present communication, excision of the ossified muscle has, however, been of distinct advantage, as in nearly two years there has been no recurrence nor apparently any disability resulting.

In the traumatic variety, or if we might use such a term as acute traumatic, where the condition has followed the receipt of one severe injury, operation and the complete excision of the degenerated muscle and fibrous tissues have resulted in complete relief.

Through the kindness of Dr. Keen, I am able to report his case, and thus give an illustration of the two great varieties of this very peculiar affection. It was my privilege also to assist him in the operation performed upon his patient, and to see her constantly during her convalescence.

These are the only cases I have ever been fortunate enough to see, and in my own case I was at a loss at first to account for the condition which I found at operation; indeed, for a time, and until I received the report of the pathological findings, I feared that it might be sarcoma. The complete freedom from pain made me feel somewhat reassured.

CASE I. *Myositis Ossificans Traumatica*.—A young man, twenty-six years of age, of robust health and fine general physique, whose occupation was that of schooling young hunters, was

kicked by a horse, December 15, 1900. He had never had rheumatism, but had a slight mitral murmur. The hoof struck him in the middle of the thigh on the anterior surface. The blow was so severe that he was knocked down, and he thought the thigh broken, but in a short while he was able to get up and walk, walked his horse for some distance, and then with the assistance of some farmers was lifted into the saddle and rode home. The pain was intense, but not completely disabling. A remarkable thing about his injury was that the horse kicked him on Saturday with such force that he thought the thigh was broken, but he was able to walk; and the next day, being Sunday, he did not ride, for this is their custom at his stock farm; but on Monday he got on a horse and had ridden every day until I saw him. He had comparatively little pain except upon extending the thigh and flexing the leg upon the thigh; and he found of late that he did not feel secure in his seat when riding a restless horse, and that his efforts to clutch with his knees gave him pain. He had none of the dull aching or throbbing pain of a sarcoma.

When first seen by me on January 5, 1901, just three weeks after the receipt of the injury, there was a marked swelling on the anterior surface of the left thigh about its middle, and over which the muscles readily rolled. The swelling was hard, but did not feel bony; it gave rather the sense of an organized hæmatoma beneath the periosteum. With the limb at rest there was no pain whatever, but on certain movements of the limb there was pain; this was most marked upon flexing the leg upon the thigh.

On January 8 I made an incision through the rectus muscle down to the periosteum. I found the whole area of the bone—especially of the anterior surface—enlarged and the periosteum thickened, and the muscles—particularly the deeper fibres—containing small bony particles. The pieces of bone and muscular tissue that I removed were directly in contact with the periosteum, which was elevated and the bone beneath found roughened. At one place I removed a small spicule of loose bone. I curetted the bone, removed all the thickened portion of the muscles that I could, and closed the wound with an iodoform gauze wick for drainage. He made an absolutely uneventful recovery, and he had no pain or discomfort.

The muscles and fibrous tissue removed were sent to Dr. W. M. L. Coplin, who sent me the following report:

After a very detailed and minute description of the methods employed in making the examination and of the microscopic appearances of the specimen, he states:

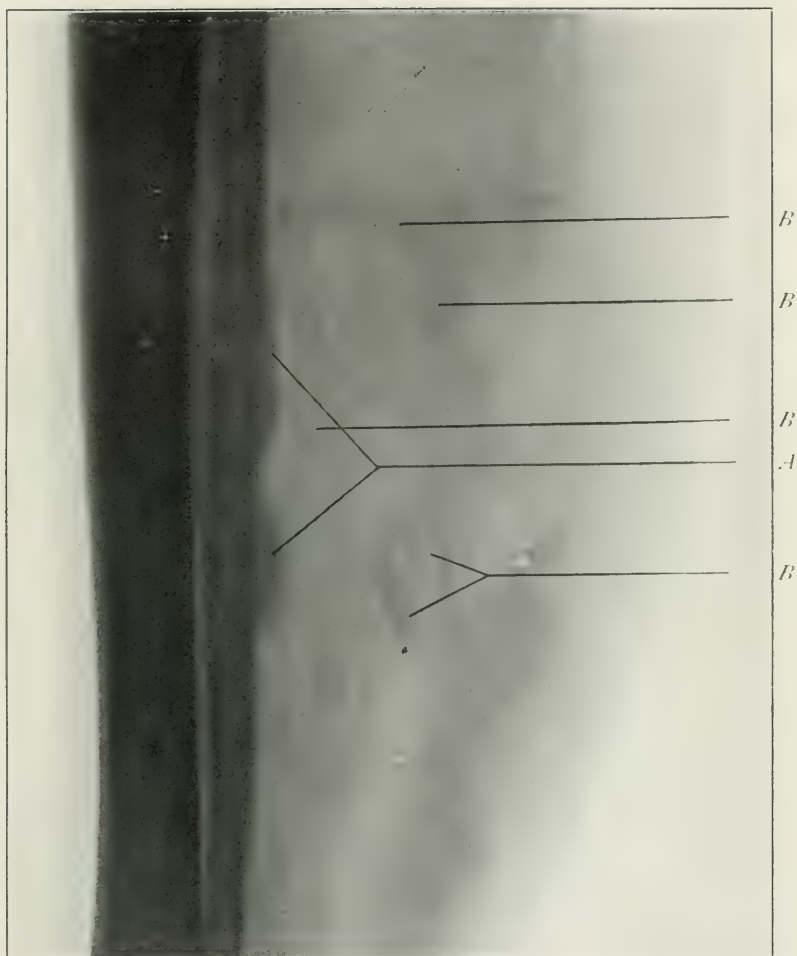
"A definite diagnosis from the examination of disconnected fragments of tissue, such as those submitted in this case, may seem hazardous, but the findings recorded above strongly suggest the diagnosis of ossifying myositis."

CASE II. *Myositis Ossificans*.—Miss A., aged forty years, first consulted Dr. W. W. Keen on April 22, 1901. At nine years of age her mother discovered a slightly tender lump over the left fibula near the junction of the middle and lower thirds of the leg. She had some pain in the leg, which was thought to be rheumatism. At fourteen, walking became distinctly painful, and the muscles gradually contracted until her foot was in marked extension, *i.e.*, an acquired equinus. At sixteen, tenotomy was done, the deformity, however, returning immediately. Some X-ray pictures which she had had taken in Washington showed that there was apparently an irregular, sharp osteophyte growing from the fibula at the point indicated (Fig., A), and that the bone was thickened for some distance above and below this point. There were some other spots in the picture which made me suspect myositis ossificans, though I was doubtful whether they might not be defects in the photographic plate.

The muscles of the right calf were distinctly harder than those of the left calf. I advised operation, which was accepted at once.

Operation by Dr. Keen, May 3, 1901.—I had three objects in view: first, to chisel away the supposed osteophyte, which was still quite painful; second, to lengthen the tendo Achillis, and, third, to remove all of the supposed ossified plates if I could do so.

I made an incision somewhat posterior to the fibula. This passed through quite a thick layer of fat. The deep fascia I found to be irregularly thickened with plates of what I judged to be bone at various places. These multiple bone plates extended well back to the middle of the calf, but, apparently, not to the inner side of the leg. There were also a considerable number of them in the muscular tissue. There was no osteophyte growing from the fibula, but the irregular plates of bone were in contact with the fibula. In order to remove the whole of these bone plates, I was obliged to prolong my incision, so that it finally



Skiagraph of the bony plates in Dr. Keen's case of myositis ossificans. *A*, the apparent exostosis from the fibula; *B*, the other osseous plates in the muscle.

reached from the upper end of the calf nearly to the heel. At one place there was very annoying though not serious bleeding, which I could not control by repeated ligature and suture-ligature. What I thought to be a large vein ran along with the bleeding artery. Finally, in order to control the bleeding, I cut across both artery and vein, and to my surprise found that the supposed vein was a large nerve. It was very much enlarged, was beaded, and so intimately involved in one of the plates of bone and fibrous tissue constituting the disease that it could not be dissected out, and would have had to be sacrificed in any case. I stretched the two ends of the nerve (for they were separated 2.5 centimetres when the foot was flexed to a right angle), when I discovered what it was, and united them with two silk ligatures. The tendo Achillis was divided after Mr. Anderson's and my own method and lengthened by four centimetres, which allowed the foot to be placed at a right angle with the leg.

On May 12 I removed two small tumors, one from the right and one from the left breast under cocaine anæsthesia. Professor Coplin reported them to be "peri- and intercanalicular fibromata of the breast."

Recovery from all three operations was *per primam*, and she left the hospital on May 18. She was then able to move the foot quite freely both in flexion and extension.

I was extremely doubtful at the time, and still am, as to what nerve was divided. The day that she left the hospital, a hair lightly drawn across the foot was felt distinctly at every point, with the exception of the sole (due probably to the thickness of the epidermis), and at a small area above the heel, where sensation was quite imperfect. On the sole of the foot, however, a touch of a pencil was readily perceived. The nerve divided lay almost in the middle line of the leg between the calf muscles and the skin. This would exclude, of course, the posterior tibial; yet it was so large,—its size being about that of the normal posterior tibial,—that it did not correspond with any ordinary cutaneous nerve. Sensation, moreover, was but slightly affected by its division, as I have indicated. Unfortunately, I was not able to make more accurate and frequent examinations on account of absence from the city.

Miss A. writes me under date of December 17, 1902, nearly twenty months after operation, that she has suffered no pain in the

muscles since leaving the hospital, that the foot can be flexed to a right angle, and that she can bear her weight on her toes. Non-recurrence of the disease, especially in view of the evidently diseased condition at the margin of the portions of tissue removed, as shown by Dr. W. G. Spiller's report, is especially noteworthy.

Dr. Spiller's report on the nerve and muscle is as follows:

"The tissue removed at operation and sent to me by Dr. Keen is exceedingly dense, much denser than any normal muscle, and in some places has a gritty feel. It can, however, be easily cut with a knife, and when embedded does not turn the edge of a microtome knife. It is not necessary to employ decalcification. To the naked eye the tissue has little or no resemblance to muscle, but appears like dense, fibrous material. In microscopical sections where the alteration is greatest the tissue resembles tendon, and has a glassy appearance when stained with eosine. Numerous masses of closely packed round cells are found throughout the sections, and much recent infiltration of red blood-corpuscles, the result of the operation, is found. The walls of the blood-vessels in the dense fibrous tissue are much thickened, and are infiltrated with round cells, and the lumen in some is very small. Where the tissue is most altered, the muscle-fibres are extremely atrophied, and in a large portion of the tissue have entirely disappeared. The sections in some parts consist almost entirely of fibrous and fatty connective tissue, and here the muscle-fibres are widely separated from one another by this fibrous tissue. In these places the muscle-fibres appear as long slender bundles in longitudinal section, and are many times smaller than normal muscle-fibres, and are without any striation, either transverse or longitudinal. The tendon-like appearance of certain parts of the sections is due to the fibrous proliferation which has caused more and more pressure upon these atrophying muscle-fibres until they have entirely disappeared. Here and there in these tendon-like masses a few scattered muscle-fibres may be seen. The Weigert hæmatoxylin stain shows their presence very beautifully. Where the muscle-fibres are very much atrophied, the sarcolemma nuclei appear unusually numerous; but this is chiefly because the atrophied fibres occupy less space, and the sarcolemma nuclei are, therefore, brought closer together. There is, however, some increase in the number of the sarcolemma nuclei. Only in tissue taken from the edges of the mass removed at operation have I

been able to find muscle-fibres of anywhere near normal size; and here they are irregular in outline, are cleft transversely in longitudinal section, and have lost the transverse and longitudinal striations. The sarcolemma nuclei in these muscle-fibres are proliferated, and in places form chains of nuclei within a muscle-fibre.

“Osseoid plates are not very numerous, but are found in some sections. They are irregular in shape, and stain a deeper purple at the edges with hemalum and faintly in the interior. They contain concentric lines and numerous irregular starlike bone cells. The formation of the latter has not been of very long duration, as in old bone the cells do not possess these numerous proliferations. Although the tissue feels gritty before it is embedded, the sections under the microscope do not contain a large amount of osseoid tissue. I have found a mass in one of the sections that appears more like cartilage than bone. In this the nuclei are small and round and the cells resemble cartilage cells. The ground substance is pale yellow, and does not show the concentric markings seen in the distinctly osseoid tissue.

“The condition is one of myositis fibrosa passing into myositis ossificans.

“The nerve that was cut during the operation is much degenerated, and is embedded in the proliferated fibrous tissue, so that even under the microscope it forms an intimate part of this tissue. The connective tissue between the individual nerve-fibres is greatly increased in amount, and for this reason the nerve appears abnormally large.

“In regard to the recent literature on myositis ossificans, I may refer to the valuable paper by Lydia M. Dewitt (*The American Journal of the Medical Sciences*, September, 1900, page 295), and to the monograph on diseases of the muscles by H. Lorenz (Nothnagel's ‘*Specielle Pathologie und Therapie*,’ Band xi; 3. Theil; 1. Abtheilung). In these two publications most of what is known of myositis ossificans may be found.”

ON THE PATHOLOGY OF SO-CALLED BONE ANEURISMS.

BY HARVEY R. GAYLORD, M.D.,

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(From the Pathological Laboratory of Professor Orth, in Göttingen.¹)

THE term "bone aneurism" has been applied to certain obscure, pulsating, markedly hæmorrhagic tumors of bone. These tumors have not received as much consideration in the more recent literature as in the days of Dupuytren, Velpeau, Nélaton, Jr., and Gentilhomme, when they were the subject of a spirited controversy which was terminated by the thesis of Gentilhomme in 1863, which concluded, "que les aneurysmes des os n'existent pas." The entire subject might well have passed into obscurity, had it not been revived by an article by Oehler in the *Deutsche Zeitschrift für Chirurgie*, 1893, who concluded that bone aneurism was a specific affection and worthy of separate consideration.

The first reference to the affection was made by Percival Pott, but a satisfactory description was first given by Else in 1769. Turning to the work of Richet and Volkmann, we find that these authors accept five cases which have come down through the literature as examples of bone aneurism.

The first case, that of Pearson, occurred in a laborer sixty-three years of age, otherwise in good health. The tumor made its appearance below and on one side of the patella. There was no evident pulsation at this time. Four months later the tumor had increased in size, protruded on both sides of the patella, and pulsated sufficiently to be visible to the naked eye. Amputation

¹ The material for this article was obtained while the writer was an assistant to Professor Orth in the University of Göttingen in 1897. The publication of the article has been unavoidably delayed until the present time.

was decided upon and was made above the knee. So soon as the large vessels were divided, a considerable amount of blood flowed from the crural artery, and the sac immediately became flaccid. Following the operation, the stump became infected, and the patient died of pyæmia five weeks later. On dissecting the limb, the vessels *of which had been injected*, nothing abnormal was found until the sac was opened on its anterior aspect, when it was found to contain red injecting material and coagulated blood as well as some material of offensive odor. On clearing out the sac this was found to occupy a cavity in the head of the tibia sufficiently large to contain half a pint of fluid. The anterior and posterior portions of the tibia were completely destroyed. The wall of the sac resembled thickened periosteum, and was lined with a substance similar to that found in aneurismal tumors. The two lateral portions of the tibia were so thin as to be transparent. The joint was not involved. Pulsation was attributed to the intimate communication of the sac with the vessels in the ham, but the presence of the red injecting material distinctly indicates that the tumor communicated with some branches probably of the popliteal.

In Case 2, that of Scarpa, the tumor was likewise located in the upper end of the tibia, and in many respects closely resembles that of Pearson, with the exception that seven years after the removal of the sac a second tumor extending to the thigh developed, from which the patient died. In this, as in the case of Pearson, the tumor appeared to communicate with branches of neighboring vessels. The recurrence of the tumor speaks for the malignant nature of the growth; although Scarpa considered the aneurism to be the result of rupture of blood-vessels leading to the destruction of the bone and the formation of a cavity therein.

Case 3, Carnochan, was a cyst located in the lower end of the femur, which formed eight months after contusion at this point. In this case pulsation and a distinct bruit were observed. Ligation of the femorals was followed by cessation of pulsation and a decrease in size of the tumor. The wall of the cyst contained a structure of bone and did not collapse. In the course of five or six weeks the cyst was again distended and amputation of the femur was performed. The cyst proved to be of large size and was filled with blood, and communicated with several vessels. Examination was made for *sarcoma and carcinoma*, but neither was detected.

Case 4 was a large tumor in the neighborhood of the tuberosity of the tibia. Fluctuation could be elicited and slight pulsation was present; no bruit. Amputation of the femur was performed, followed by healing, with no return of the tumor after two and a half years. Dissection of the tumor showed that the head of the tibia was transformed into a large cyst cavity, the wall of which was very thin and extremely elastic. It was filled with fresh blood and clots. A microscopic examination was made and *no tumor elements were detected*. Injections of water through the popliteal vessel revealed numerous communications with the tumor through minute openings on the inner surface of the cyst wall.

Case 5, Richet, developed in the neighborhood of the shoulder and extended from the insertion of the deltoid to the acromion process, with involvement of the entire circumference of the humerus. The tumor was soft, fluctuating, and in many spots crepitation could be elicited. There was a distinct bruit but no pulsation. Amputation at the shoulder was made, followed, after four weeks, by death. At the autopsy no metastases were detected. The tumor consisted of a large sac filled with brown fluid and coagula. The wall of the sac was composed of a dense, fibrous structure, which, below, was apparently continuous with the periosteum and extended upward to the articular cartilage of the head of the humerus. The wall of this sac contained irregular plates of bone. Attempts to inject the sac from the larger vessels were not successful, but many small arteries could be seen penetrating the cyst wall. *A microscopic examination was made of the cyst wall, but no tumor elements were found.*

Besides the five classical cases here referred to, three articles have appeared in the recent literature containing the reports of cases of a similar nature in which microscopic examination failed to show the presence of sarcoma or carcinoma. They were likewise considered as cases of bone aneurism by the respective writers.

The first is that of Pillot and Anger, in which the tumor developed in a man of twenty-six years posteriorly on the inner side of the lower end of the femur. On admission to the clinic, the tumor was distinctly palpable, elastic, and tense, but did not

pulsate, and there was no bruit. The tumor was supposed to be due to a collection of pus beneath the periosteum. On cutting into the tumor, a large amount of dark-colored blood flowed from the cavity. The hæmorrhage which followed was controlled with great difficulty. The patient had chills, elevation of temperature, and four weeks after the incision the leg was amputated at the thigh. A large thrombus was found in the femoral vein, and the patient died the next day of pulmonary emboli. On dissecting the amputated leg, the tumor occupied a position beginning four centimetres above the condyles of the femur on the posterior aspect and extending upward seven centimetres. Beneath the periosteum were found three connecting cavities filled with blood. The first was beneath the periosteum, and had been incised at the first operation; the second, within the cavity of the bone, and the third, beneath the periosteum on the anterior surface. All three were in communication with larger and smaller vessels. The periosteum at the posterior margin contained numerous deposits of bone and osteophytes. The cavities of the tumor were lined with stratified layers of fibrin. The microscopic examination was made in the laboratory of Professor Robin and reported upon by M. Gaucher. The exact wording of his statement is as follows: "On microscopic examination, one could hesitate between aneurism of the bone or myeloid sarcoma. My microscopic examination of the clots, of the bone, of the bone marrow, and of the osteophytes formed in the periosteum, has failed to disclose the presence of an increased number of giant cells. I therefore consider that the femur is the site of a true aneurism of bone."

A further case is that of Wythe. The tumor occurred in a young woman, twenty-two years of age, and appeared in the form of a small swelling about the size of a walnut on the upper third of the left femur. After about eight months' duration it began to enlarge rapidly. It occupied the front and inner side of the upper third of the thigh, and on touch gave the sensation of a cartilaginous mass springing from the bone. The femoral artery lay across the side of the tumor and pulsated vigorously. The case was seen by Wythe, who operated. Cutting down upon the tumor, it was found to consist of a lobulated mass three by four inches, arising from the upper part of the femur. The surface of the tumor was of a mottled red and bluish color, crackled on pressure, and appeared to cover a thin layer of bone like an egg-

shell. On cutting into the tumor the blood spurted out for a distance of eight feet. This was of dark venous hue and was controlled by pressure with a sponge. On enucleation the tumor was found to contain many cancellous spicules of bone, which had to be removed in fragments. The cavity was packed with a sponge wrung out in hot water and hæmorrhage was thus controlled. Patient made a rapid recovery. The microscopic examination is quoted literally:

"A careful microscopic examination of the tumor exhibits only bony tissue, softened and expanded, and the débris of blood-cells. There is no appearance of cartilaginous, sarcomatous, malignant, or embryonic elements of any kind, although specimens were selected from various parts of the mass, some examined without special preparation, and others after staining with picrocarmine. It is evidently a case of bony aneurism, not from enlargement of an artery, but an aneurism by anastomosis. The microscopic evidence shows the edges of the osseous trabeculæ, which bound the natural cavities or cancelli of the bone, to be decalcified and softened.

"The general appearance of the morbid tissue resembled spina ventosa, but the enlargement was due to simple dilatation of the bone itself. In the few cases of the kind which I find on record, most are associated with encephaloid cancer, but no indication of this was furnished by the dissection or by the microscope in this instance."

A third case, that of Oehler, occurred in a sixteen-year-old boy. There developed after slight trauma a tender swelling on the lower end of the femur. This protruded most prominently above the outer condyle. The consistence of the tumor was elastic, and the margins appeared to gradually merge into the shaft of the femur. There was no pulsation. The tumor was held to be sarcoma of the bone, and exploratory incision was made to confirm the diagnosis. The tumor was incised at the point of greatest prominence above the external condyle, and a gush of blood followed the incision. The finger was inserted and entered a cavity in the bone. This was packed, but the packing failed to control the hæmorrhage. After a few hours, the bleeding was so severe that the patient was again anæsthetized and the exploratory incision widened. The cavity appeared to be sufficiently large to contain 300 cubic centimetres of blood. It extended three-quarters

of the way around the femur and penetrated deeply into the bone, so that not more than a half or a third of the normal thickness of the shaft of the femur remained. The inner aspect of the cavity was lined with rough fragments of bone, and the outer wall of the cyst was composed of dense fibrous tissue in which plates and deposits of bone could be detected. There were apparently no communicating vessels. As a result of this inspection, amputation of the leg was decided upon, from which the patient made a rapid recovery, and has since remained permanently cured. The examination of the amputated limb confirmed the macroscopic description already given. No communicating vessels could be detected, and there was no macroscopic evidence of sarcomatous tissue. Blocks of tissue were removed from various portions and prepared for microscopic examination. These, under the microscope, proved to consist of bony structure without lamellar arrangement, and closely resembled in appearance newly formed callus. The spaces between the trabeculæ were filled with a tissue rich in cells. The bone corpuscles appeared in the form of large granulated cells lying in encapsulated spaces. The usual prolongations of these cells could not be detected. Scattered between the trabeculæ were areas of cartilaginous tissue. The medullary spaces were traversed by large vessels surrounded by round cells. From the periphery towards the cavity the osteoblasts gradually increased in size, the round cells were more densely packed, and a few giant cells made their appearance, until at the margin of the blood-filled cavity these elements formed a narrow margin of tissue free from bone trabeculæ. There was no evidence of a capsule or organized layer of connective tissue separating the cavity from the bony structure. This condition of affairs existed over the entire surface of the cavity, including the portion where it penetrated into the shaft of the femur. In the wall of the cavity in many places were found groups of cells embedded in coagula. These, as well as the narrow layer of tissue lining the cavity, especially where the cells were cut obliquely, closely resembled round and giant-cell sarcoma, but in the opinion of Oehler did not constitute a distinct *sarcomatous tissue*, for the reason that *there was no well-defined boundary between it and the tissue of the medullary spaces.*

From a consideration of the three cases of Anger, Wythe, and Oehler, it will be noted that in the first two the statement

is made that sarcomatous tissue was not present. The description of the microscopic examination in the case of Wythe is far from satisfactory, and the grounds on which Gaucher concludes that the case of Pillot and Anger was not of sarcomatous nature would seem open to question. His conclusion, that because the giant cells were not increased in number, and therefore the case was not one of sarcoma, is not in accord with our present knowledge of these neoplasms. The statement of Wythe regarding his case leaves some doubt as to the basis on which he concluded that sarcomatous tissue was not present; and the many cases of well-defined sarcoma recently published, especially those of Weil and Oberst, of sarcomas of bone in which large cavities containing blood were formed, the cavity being lined with sarcomatous tissue, so strongly suggests the structures described by Oehler, that it is difficult to say how that author arrives at the conclusion that his case, and probably the five quoted by Richet and Volkmann, represent a separate, obscure affection of the bone. Oehler calls attention to the fact that these tumors seldom produce metastases, that recurrence after operation is rare. The case of Scarpa is, however, an exception to even this last statement, recurrence after seven years in this case strongly indicating the malignant nature of the process.

That these cases are not as malignant as many forms of sarcoma is well known. A number of clinical observations have been reported, in which fluctuating, hæmorrhagic tumors of bone, or bone aneurisms, have been observed to disappear after a period of time. One of these, reported by Roughton, was subjected to microscopic examination and found to be a sarcoma. The tumor developed below the knee; it was elastic on palpation, and the wall of the cyst appeared to contain thin plates of bone; there was no pulsation, no bruit. The tumor was incised, and a cavity containing approximately sixty cubic centimetres of blood was opened. There was no evidence of communication of this cavity with larger vessels. A portion of the wall of the tumor was removed for examination, which showed the presence of sarcomatous tissue. In the course of

ten months the tumor entirely disappeared, and the function of the parts was completely restored.

Realizing the nature of the claim which the so-called "bone aneurisms" have to classification as separate affections of the bone, rather than malignant tumors with unusual characteristics, the following case may not be uninteresting.

Description of writer's case. The specimen in question was sent to the Pathological Institute in Göttingen, April 3, 1897, from the Peter Friedrich Ludwig Hospital, Oldenburg. The following short history accompanied the preparation, and attempts to obtain a further history one year later were not successful. The patient had suffered three years before from a fracture of the lower end of the right femur produced by direct force, which had healed satisfactorily. One year later the patient slipped while walking across a slippery floor, and in attempting to steady himself stiffened the right leg forcibly, and the femur was again broken at the point of the old fracture. This second fracture was again followed by healing, which was accompanied by excessive callus formation and succeeded by an unusual amount of thickening at the point of fracture. In the course of the second year this thickening increased until the size of the present tumor was reached. At this time the patient came into the Peter Friedrich Ludwig Hospital, Oldenburg, where the diagnosis of sarcoma was made and amputation performed. On cutting into the tumor, a quantity of grayish yellow material flowed from a large cystic cavity and from a smaller, fluid blood. Fluctuation was easily elicited before the operation. It will be noted that there is no reference to pulsation or the presence of a bruit.

Macroscopic description of tumor. The specimen sent to the institute consists of the lower two-thirds of the right femur. This portion of the thigh is markedly distended, and forms, on the anterior surface, a rigid tumor over which the soft parts are tensely stretched. The involvement begins just above the condyles and extends upward to about the middle portion of the femur. On the outer and posterior aspect the wall of the enlarged femur is elastic and can be compressed. The articular surface of the condyles and the sawed end of the femur above present no abnormalities. It is decided to divide the femur in its long axis into anterior and posterior halves. After sawing through

the bone it is found to contain a large cavity, the inner wall of which extends downward to a point just above the internal condyle. This portion of the cyst wall contains extensive deposits of bone and has to be sawed. The condyles below are sawed in the same plane, and the outer aspect of the cyst is readily divided with a knife. On laying open this cavity it is found to possess the following dimensions: The greatest length in the long axis is twenty centimetres; the greatest diameter twelve centimetres. Projecting into the cyst cavity just above the external condyle is a mass of spongy tissue about the size of a large lemon, or more exactly, when measured in the long axis of the cyst, nine centimetres and transversely five and one-half centimetres. The surface of the anterior wall of the cyst is of dark-red color, finely granular to the touch, and in many places covered with a distinct layer of fibrin. This can usually be stripped from the surface with forceps, and then exposes a smooth underlying surface. Extending from below posteriorly, from a point about midway between the condyles at the epiphyseal line upward to a point where it becomes continuous with the outer and posterior aspect of the shaft, is a ridge which divides the anterior wall of the cyst into two portions. This ridge on palpation is hard, and evidently represents a continuation of the shaft of the femur upward through the wall of the cyst. The entire anterior wall of the cyst is found to possess a groundwork of bone from one millimetre in thickness at the thinnest part to thirty millimetres at the prominence of the ridge just mentioned. On inspection of the cut surface of the internal wall of the cyst, it presents a roughened, stratified appearance which, from within outward, consists first of a thin layer of fibrin lining the cyst cavity; beneath this a dark-red zone, then a grayish-white zone, which in certain parts are replaced by distinct deposits of bone, and over this the muscular structure of the thigh. An examination of the shaft of the femur above shows that the medullary cavity of the shaft is separated from the cyst cavity by a layer of hard bone three millimetres in thickness. Upon this is a layer of apparently fibrous tissue with the usual deposit of fibrin upon the surface. The shaft of the femur at the lower portion just above the condyles shows a rough, uneven surface, and at the point where the mass of spongy tissue protrudes into the cyst cavity are numerous cystic excavations in cancellous portion of the bone. The mass of tissue already men-

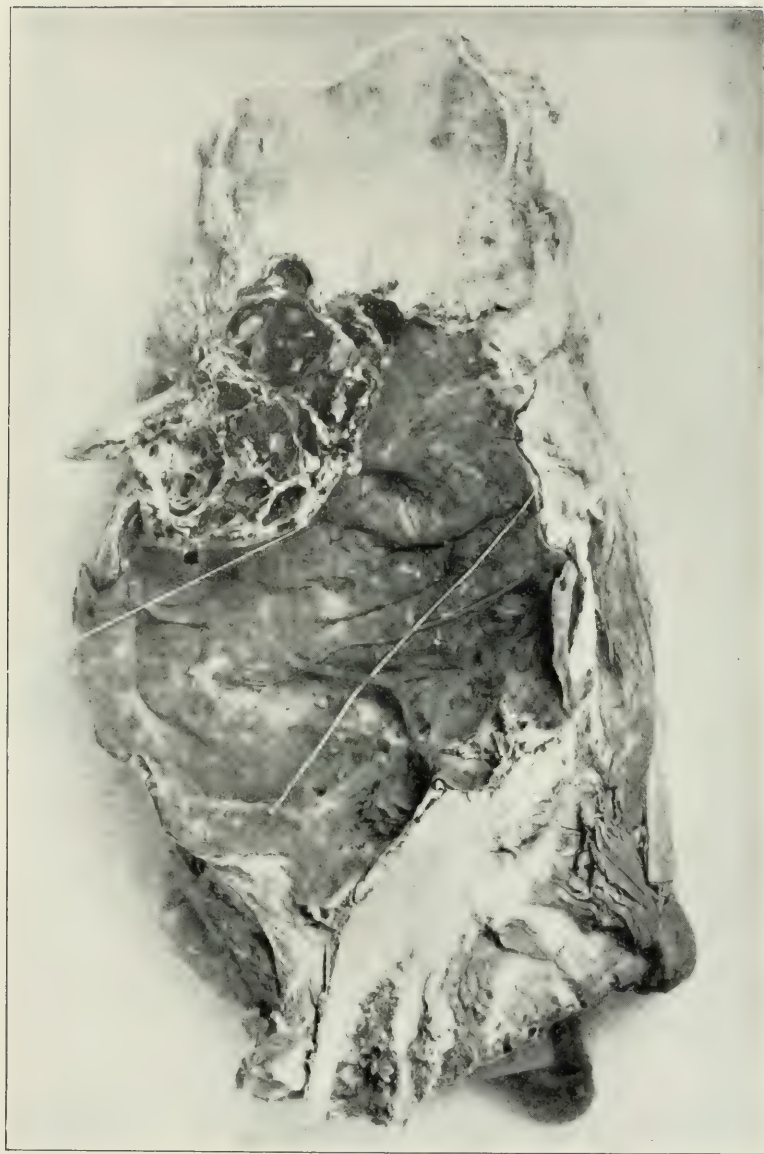


FIG. 1.—Posterior surface of sarcomatous hematoma of lower third of femur. At *a*, a mass of cavernous tissue extending into the cyst cavity. At point *a* characteristic sarcomatous structure was detected. Traversing the wall of the cyst, two well-defined arterial branches supported by a probe.

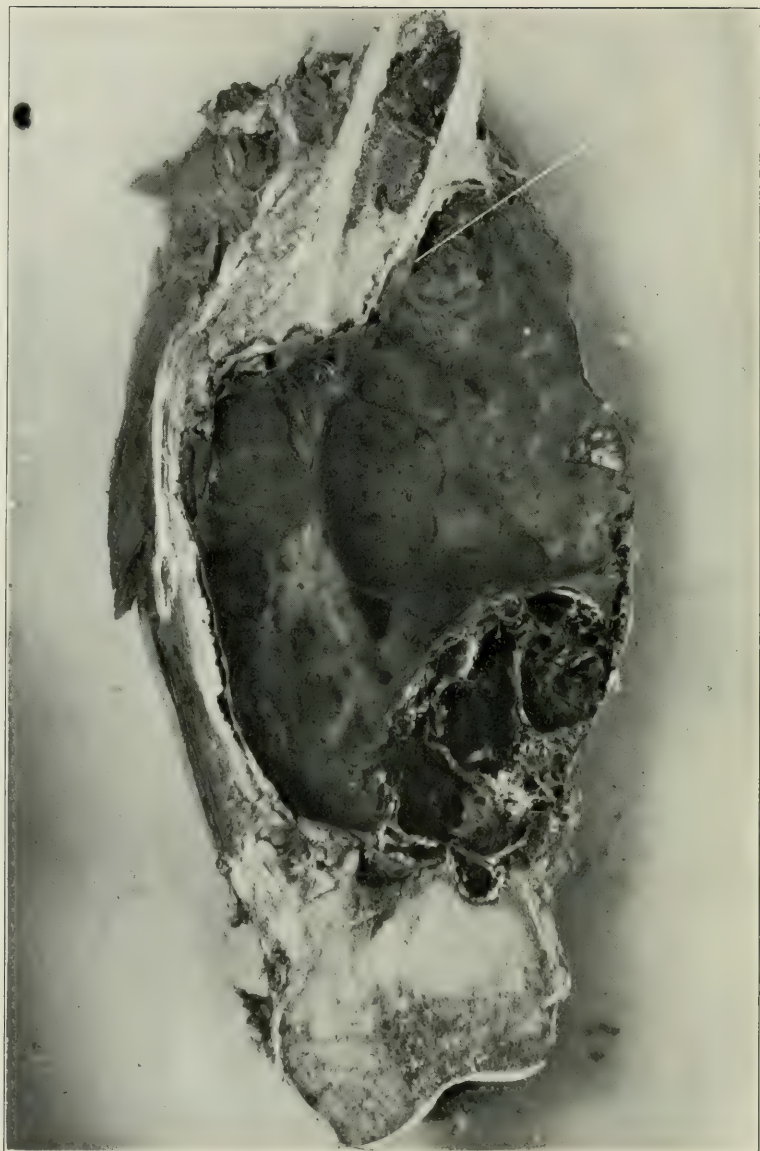


FIG. 2.—Anterior aspect of the same cyst. Continuation of the shaft of the femur is found in a rib passing along the anterior aspect of the cyst cavity. At *a*, point showing repair of the shaft of the femur at its junction with the cyst wall.

tioned possesses a grayish groundwork which separates the small, but numerous, hæmorrhagic cysts. The posterior wall of the cyst is more or less collapsed, the surface being thrown into numerous folds and wrinkles. Palpation discloses but a few thin plates of bone irregularly distributed. Traversing the posterior surface and running free in the cyst cavity for a considerable distance are two blood-vessels. The larger of these has a diameter of three millimetres, the smaller of one and one-half. Although the limb was not dissected to definitely ascertain their origin, they are probably branches of the popliteal. Sections for microscopic examination were taken through the thickness of the internal wall of the cyst, from the upper end of the femur where it terminated in the cyst, from the internal wall, and a large number of pieces were cut from the spongy mass of tissue protruding into the cyst cavity.

The examination of the sections, hardened in formalin, stained with hæmatoxylin eosin taken from the internal portion of the cyst wall, shows that the surface of the structure is composed of young connective tissue, the most superficial layer of which contains numerous capillaries, here and there occasional deposits of pigment. Supporting this newly formed connective tissue is a layer of mature connective tissue. The boundary between the two is marked by frequent deposits of brown pigment, for the most part located about the blood-vessels. Much of this is deposited in the spindle cells. Attempts to demonstrate iron in this pigment were unsuccessful, probably owing to the method of hardening (formalin). In the deeper portions of the layer of fibrous connective tissue nuclei are very rare, intercellular substance predominating. Beneath this layer of dense, fibrous, connective tissue is a more loosely arranged fibrous structure containing a certain amount of fat tissue. Interposed between the bundles of connective tissue are numerous large blood-vessels. Surrounding this is a layer of muscular structure. Nothing not already learned with low power could be detected by examination under high magnification. The pigment is in the form of oval bodies and plates, and much of it lies between the cells. The young connective tissue upon the surface presents the appearance commonly found in organizing exudates.

Section taken from the wall of the cyst at the point where it becomes continuous with the upper end of the femur stained with

hæmatoxylin alizarin. At the margin of the preparation is a mass of bone which shows an irregular, comparatively smooth contour. At certain points there are projections of smoothly shaped trabeculæ extending into the adjoining connective tissue. Along the smooth margin of the bone are well-defined osteoblasts in considerable number. The connective-tissue structure immediately adjacent to the bone closely resembles the appearance of normal periosteum, but in the portions which constitute the larger spaces between the newly formed trabeculæ this tissue presents evidence of myxomatous degeneration (Fig. 3). Here and there evidence of fat cells in the tissue may be detected. The bone corpuscles are irregularly formed and the canaliculi are poorly developed, for the most part wanting. At one point in direct apposition with the lamellated bone is a deposit of dark-brown pigment similar to that found in the portion of the cyst wall already described. The connective-tissue structure between the trabeculæ consists of slender connective-tissue elements and, except where it has undergone the myxomatous change, closely resembles normal periosteum. Separating this structure of trabeculæ is a layer of dense fibrous connective tissue containing a considerable number of blood-vessels. The direction of the connective-tissue cells in this zone is parallel to the surface of the cyst cavity. Upon the surface of the cyst is a thin layer of fibrin. In some portions this is undergoing organization, the young connective tissue containing extensive deposits of pigment, as in the other portion of the cyst wall.

Sections made from various other localities in the cyst wall fail to develop any radical difference in the structures already described. A large number of sections were made from the mass of spongy tissue protruding into the cavity from the anterior inferior portion of the cyst. Most of these revealed a connective-tissue structure surrounding cavities filled with red blood-cells and containing extensive deposits of pigment. After a prolonged search, a portion of tissue somewhat lighter in color than those already examined was found, and this, on microscopic examination, presented points of great interest (hæmatoxylin eosin). The structure in this case presents an appearance which would justify the diagnosis of sarcoma (Fig. 4). The tissue has been the seat of frequent hæmorrhages; but where the structure is not obscured, it is composed of spindle and oval elements, vary-

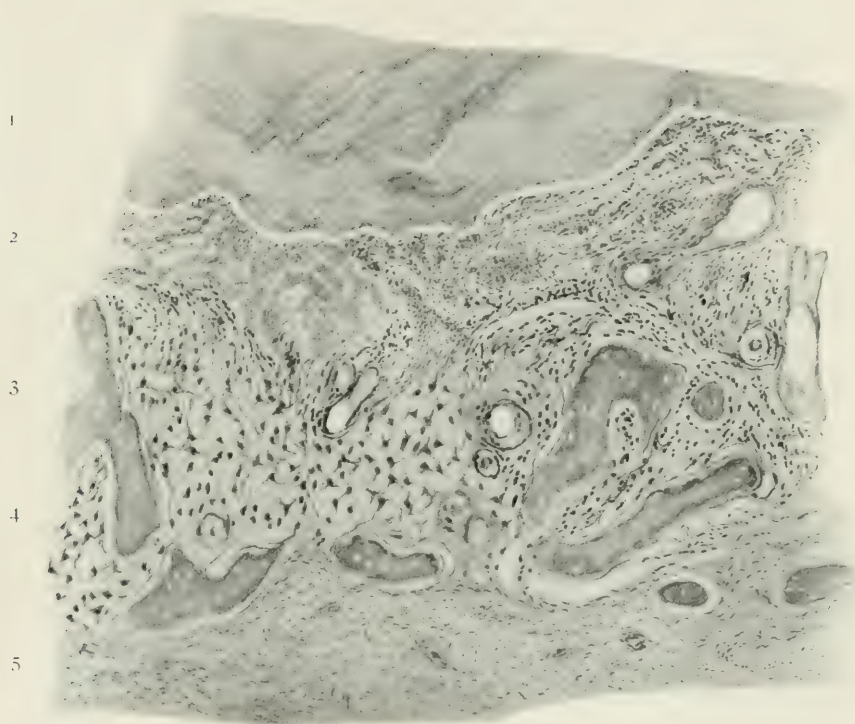


FIG. 3.—(Haematoxylin alizarin.) Section through end of shaft of femur, point *a*, Fig. 2. At 1, newly formed compact bone; 2, spindle-celled connective tissue with deeply stained nuclei; 3, isolated deposits of compact bone; 4, myxomatous tissue; 5, fibrous connective tissue forming wall of cyst.

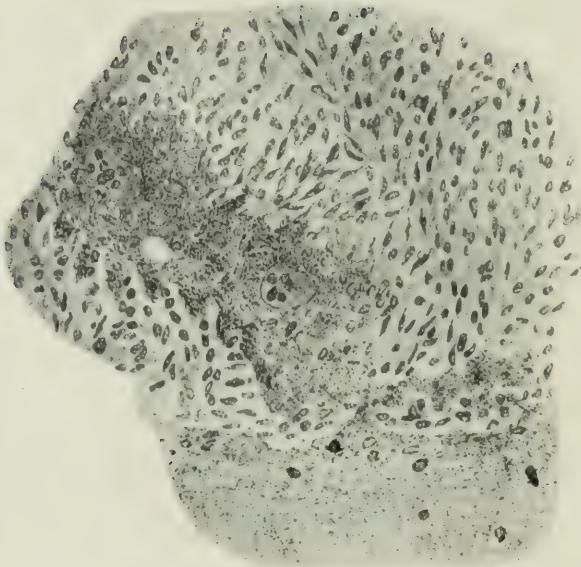


FIG. 4.—Section through sarcomatous tissue removed from point *a*, Fig. 1. (Formalin hardening, hæmatoxylin eosin.) Spindle-celled sarcomatous structure and two giant cells. The darker portion represents area of hæmorrhage.

ing in size, with deeply stained nuclei. The cell bodies are not sharply defined one from the other. Running through the structure are large, thin-walled blood-vessels. At the margins of the connective-tissue structure are found occasional giant cells. These are oval or spherical in shape, do not vary greatly in size, and have an average diameter of thirty microns. They contain from four or five to as many as twelve oval, deeply stained nuclei, which are usually arranged at a point midway between the centre and the periphery of the cells. The spindle and oval cells of the tissue structure along the margin contain frequent deposits of pigment. The characteristic appearance of the spindle and oval elements of the structure leave no doubt that we are here dealing with sarcoma.

From an analysis of the microscopic findings, as well as the anatomical relations in this case, the conclusion may be justifiably reached that the tumor was originally a sarcoma developing at or near the site of the original fracture, probably in the medulla of the bone, indicated by the marked distention of the shaft of the femur and the presence of giant cells in the sarcomatous tissue. The status of the structure at the time of the examination, especially the conditions found at the ends of the femur, where these become continuous with the wall of the cyst, indicates a considerable reparative progress on the part of tissues involved. It is highly probable that the entire cavity was at one time filled with sarcomatous tissue. This is represented by the mass protruding into the cavity from the lower inner aspect. The difficulty we experienced in detecting sarcoma indicates that the process was only active in a very small portion of this mass of tissue. In reality, we had continued our search to a point where we had practically concluded that there was no sarcoma present, when we ultimately came upon a small area of sarcomatous structure which gave us a clue to the true nature of the process. It is fair to assume that the sarcomatous process in this case was practically subsiding, as in the case of Roughton already quoted.

In the light of this experience it would seem wise to reconsider the five original cases quoted by Richet and Volkmann

and the three cases subsequently published by Pillot and Anger, Wythe and Oehler. It has already been pointed out that the microscopic examination in two of the original five cases was wanting. In the three remaining cases it must be remembered that microscopic diagnosis was at the time of these publications on a much less accurate basis than at present. With regard to the three recent cases, a serious question will be raised as to the interpretation of the respective observers. In the light of our own case, we are inclined to believe that it is not impossible that the inability to detect sarcoma in some of these cases is due to insufficient search in cases in which sarcoma is actually present; that in the other cases where sarcoma is not found after adequate investigation, it is not impossible that the tumor was originally of sarcomatous nature, and that the characteristic structure had disappeared. A factor which must be of importance in the development of these large cystic cavities is the frequency with which extensive hæmorrhages occur in the substance of the tumor. The effect exerted upon the sarcomatous tissue by these extravasations of blood, especially when the whole tumor is encased in a shell of bone, must so interfere with the nutrition of the cells as not only to impede their growth, but in many cases to lead to their complete disintegration. This is well evidenced in the status found in the sarcomatous tissue in our own case (Fig. 4). With the disintegration and removal of the tissue, the cavities formed, being already in communication with the smaller blood-vessels, become filled with fluid blood. With the progress of development of these cavities in the tumor, larger arteries, when in the immediate neighborhood, are ultimately involved. It is to be noted that on the posterior aspect of the cavity, in our own case, were two large vessels completely isolated, but which were at the time of the operation intact. Pulsation was not present in this case, but it may be readily conceived that a rupture of either of these larger branches would have resulted in the development of this phenomenon. Communication with larger vessels in the cases in which pulsation and a bruit were present was probably established in a similar manner.

Through the repeated recurrence of hæmorrhage, the sarcomatous tissue can be reduced to a minimum, or, as in the case of Roughton, entirely disappear, and the affection terminated by a form of spontaneous cure.

With the experience gained in our own case and after a review of the cases in the literature which constitute the claims of this affection to special consideration, we are inclined to the view that in all probability the greater portion, if not all, of the cases of bone aneurism were originally medullary sarcomata; and we would conclude with Gentilhomme that, while these tumors may present the characteristics of aneurisms, their etiology and the mechanism of their development have little in common with that affection. It is, therefore, desirable to decide whether the term "bone aneurism" should be continued in the literature, or whether we should refer to these cases as pulsating sarcomatous hæmatoma of bone.

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GUNSHOT WOUND OF THE LONGITUDINAL SINUS.¹

RECOVERY WITH HEMIANOPSIA AFTER TREPHINING.

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J. McC., forty-two years of age, born in the United States, hotel clerk, was admitted to Bellevue Hospital, June 2, 1902. He had been a periodic drinker and extreme smoker, but has always been well with the exception of an attack of rheumatism, lasting two weeks, about twelve years ago. He is a widower and denies venereal disease.

About three o'clock on the afternoon of June 2, 1902, he was shot during a raid upon a pool-room, the person firing the shot standing behind and considerably below him at a distance of fifteen or twenty feet. The pistol used was of large caliber. The patient lost considerable blood, but the hæmorrhage was controlled by pressure, and he was brought to the hospital in an ambulance.

At eight o'clock, examination showed a wound in the median line on the back of the head penetrating the skull. Patient complained of severe headache, but was able to walk, and had no evidence of anæsthesia or motor paralysis. He complained of dimness of vision, and the eyes were kindly examined for me by Dr. A. E. Davis, whose report states, "There is complete blindness of the right half of the visual fields, which are cut off in the median line. Vision in the left half of fields is R. = $\frac{15}{20}$, L. = $\frac{15}{60}$; pupillary reactions are normal and Wernicke's symptom is absent. There are no motor disturbances of the ocular muscles. The fundi are normal, there being only a slight congestion present."

Operation. Ether Anæsthesia.—An incision was made in the median line over the occipital bone, and the skull exposed by elevating the periosteum on each side. The opening in the bone lay just below the external occipital protuberance, and was about

¹ Read before the New York Surgical Society, December, 1902.

half an inch in diameter. Fragments of bone were lying just within the skull with portions of hair adherent to them, and there was a wound of the brain in the same line. After picking out several small bony fragments with forceps, the removal of one of the pieces was followed by profuse venous hæmorrhage, the blood coming out in a stream nearly half an inch in diameter and rising to some distance from the skull, indicating a wound of the longitudinal sinus. Narrow strips of iodoform gauze were packed in the wound, but it required a considerable amount of gauze to control the hæmorrhage, and even then the control was not complete. A trephine button of bone nearly an inch in diameter was removed on the left side and slightly above the gunshot opening in the skull, leaving a narrow bridge between, but such furious hæmorrhage again set in that fresh packing was inserted. Another opening was made in the median line below the gunshot wound, the chisel being employed instead of the trephine, and when the dura was reached, this opening was connected with the gunshot wound and with the other trephine opening by rapidly removing the intervening bone with the rongeur. It was then seen that there was a wound in the longitudinal sinus, and that it must be near the torcular Herophili. Nevertheless, an attempt was made to close the sinus by sutures passed deeply beneath it with a curved needle. These lessened the bleeding, but did not entirely arrest it. Narrow iodoform gauze strips were therefore inserted in the wound in the sinus, which was by that time a slit an inch in length, one end being thrust backward and one forward; more packing was placed in the wound and the soft parts drawn firmly together over the gauze by sutures. The patient was nearly exsanguinated, and 1500 cubic centimetres normal salt solution were thrown into a vein of the arm. The patient was sent to bed in fair condition and reacted well. The only wound in the dura was that made by the bullet perforating both walls of the sinus. The opening in the bone finally was one and one-half by two inches.

June 3. Patient lay quiet and seemed unconscious, but was easily aroused. He complained of total blindness. Highest pulse, 94, and temperature, 102° F.

June 4. Patient brighter. Dr. Davis found him able to count fingers at ten feet, and with a perception of colors apparently normal, using, however, only the left half of the visual fields

(nasal right and temporal left eye). The pupils were a little sluggish to light. Highest pulse, 120; temperature, 101° F.

June 5. Highest pulse, 84; temperature, 101.4° F.; leucocytes, 8200. He seemed quite rational, sleeping well, and needing no drugs. Previously he had complained much of headache, and needed morphine and bromides.

June 6. The external dressings have been changed daily on account of free bloody oozing. To-day two of the sutures were removed to lessen the pressure, without increase of the discharge. Highest pulse, 80, and temperature, 101° F.

June 7. Highest pulse, 76, and temperature, 100.2° F. (After this date the temperature remained below 100° until the 21st.) He had much pain and seemed dull and sleepy, and occasionally delirious. Dr. Davis found "some indications of optic neuritis in the right eye, the retinal veins being swollen and tortuous, the outline of the disk being obliterated, and the nerve-head somewhat elevated. The fundus of the left eye was apparently normal, although the veins were somewhat distended."

June 11. Dr. Davis reports "distinct papillitis in right and beginning papillitis in left eye." Some of the packing was removed from the wound without hæmorrhage.

June 14. Dr. Davis reports "papillitis well marked in right eye, and moderately so in the left. Some hæmorrhages near the disk in the fundus of each eye, apparently due rather to transudation than to rupture of the blood-vessels." More of the packing was removed. The patient remains in the same apathetic or mildly delirious condition, having morphine occasionally for headache, but no bromide.

June 15. Very restless. Morphine and bromides both necessary.

June 16. Nearly all the packing removed. Patient very restless, moaning, delirious, trying to get out of bed. He had to be coaxed to eat, but slept well, and required no morphine. His bowels have been moving daily with laxatives.

June 17. All packing out of the wound, which has escaped infection. No hæmorrhage. Patient quieter, but shows mental confusion.

June 18. Skiagram taken showing bullet to have ranged directly forward and to be lodged about two inches from the occiput, a little to the *right* of the median line. [A later skiagram,

taken in January, 1903, showed that there was an error in this, and the bullet really lay to the left of the median line, where we would expect it to be, judging from the right-sided hemianopsia.]

June 19. Patient very delirious, talking all night and pulling off his dressings. Hyoscine given.

June 20. Very delirious, refusing food and medicine. Pulse, 90; temperature, 99.4° F. Consultation with Professor Edward D. Fisher. The choked disk and severe mental symptoms, with continuous temperature between 99° and 100°, were supposed to indicate beginning suppuration in the brain along the track of the bullet, and exploration was determined upon. Chloroform was given and anæsthesia continued by ether. The opening in the bone was enlarged on the right side, the dura incised over the right hemisphere, and careful search made for the bullet with Fluhner's aluminium probe and with Girdner's telephonic instrument, but without success. No evidence of infection or of damage to the brain was found. The wound was closed by suture, with rubber-tissue drainage from the dural cavity.

June 21. Temperature, 100.4° F. Sleeps much, but complains of pain in the head. At times he is restless and tries to get out of bed.

June 22. Patient is quieter and rational at times. Complains when the dressing is done. Temperature, 99.6° F. At night he was very troublesome, and slept only after hyoscyamine and morphine had been given.

June 23. Very troublesome, restless, destructive, and noisy all night.

June 24. Violent.

June 25. Refuses food.

June 26. Very noisy at night. Eats better, but pulls off dressing and picks at bed-clothes.

June 27. Patient has not slept. Very troublesome.

June 28. Slept fairly well. Quiet all day.

June 29 to July 4. Patient has been brighter, quieter, and easier to manage.

July 4 and 5. Very restless and troublesome, and had to be restrained. Temperature, 100° F.

July 6. Quieter. He remained about the same until August 5, when there was a marked improvement. The drain-sinus was entirely healed about August 1.

August 12. Although quieter, the patient has been completely irrational until midnight to-day, when he suddenly regained his senses, recognized the house surgeon, and talked with him about an hour. He complained of his eyesight.

August 13. Suddenly relapsed into his old state of irrational and restless behavior.

August 14. Up in a chair.

August 18. Patient again suddenly recovered his senses and recognized his friends. From that time on he retained consciousness, but remained very nervous for two or three months.

August 30. Discharged from the hospital, cured.

September 30. Dr. Davis reports "patient carries head to right side most of the time, as he sees better that way, although he can turn head to left side and see better than when looking directly ahead. R. V. = $\frac{20}{15}$, L. V. = $\frac{20}{15}$. Not improved. No astigmatism. No paralysis of any kind. Pupil normal in size and reaction. Right side of each field is cut off vertically and about five degrees to the right side of the median plane in each. He can see dimly the motion of the hand in right side of fields of vision. Patient sees better by holding head slightly to right or left. No central scotoma. Perception of colors normal in the left half of fields."

The most important lesson to be learned from this case is the great danger of removing fragments of bone from a fracture over one of the cerebral sinuses. This danger is seldom mentioned, but has been pointed out by Wharton in his article in the *ANNALS OF SURGERY*, xxxiv, 1901. But even he has not emphasized this fact as it deserves. Wharton collected seventy cases of wounds of the sinuses, and found the superior longitudinal involved in forty cases. In forty-five cases of fracture of the skull (including gunshot wounds) in which the sinuses were injured, as tabulated by Wharton, I find that in twelve cases no attempt was made to remove fragments or foreign bodies. In sixteen of the remaining thirty-three cases severe hæmorrhage was produced by removal of the bony fragments or foreign bodies from the wound. In five other cases, although details are wanting, the fragments of bone lodged in the sinus apparently prevented the escape of

blood from that vessel. It appears, then, that in over one-half of the cases of such injuries the hæmorrhage is controlled by fragments lodged in the sinus. The breach in the skull is seldom large enough to permit of easy access to the sinus, and there is danger of great loss of blood if the hæmorrhage begins again and continues while the surgeon is enlarging the opening in the skull. There is also danger of serious damage to the brain when forcible packing is resorted to in order to control the hæmorrhage from the sinus before the opening is enlarged sufficiently to allow of careful insertion of the packing material. The deduction is obvious that the fragments should not be disturbed until sufficient bone has been removed to give the surgeon complete command of the bleeding point.

A second practical lesson is the importance of marking every X-ray plate so that right and left cannot be confused. It is not enough to depend upon the usual rule to place the gelatine side of the plate next to the object to be photographed. The operator may fail to do this, or possibly the plate may be turned wrong in the envelope in which it comes from the factory. Metal letters or some similar object should be so placed as to be photographed upon the sides of the plate. Owing to the error made by the radiographer, an experienced professional, we failed to find the bullet in this case. (NOTE.—The skiagram taken June 18, and a second taken by another operator before the patient left the hospital, both indicated that the bullet was in the right side of the brain. After this paper had been read, I obtained a third skiagram, properly marked "R" and "L," showing the bullet on the left. This finding necessitated partial revision of the paper, omitting some remarks upon the contradiction between the skiagraphic evidence and the physiological rule of crossed paralysis of vision. The third skiagram and the patient were shown at the meeting at the Surgical Society held February 25, 1903.)

Fortunately, no harm seems to have come of this error, for the patient has recovered and remains well, the missile apparently having been harmlessly encapsulated. There can be no question as to the advisability of the exploration which

was made when the alarming mental symptoms, slight fever, and choked disk are taken into consideration. I still wish that I had succeeded in removing the ball, as it is possible that it may give rise to a dangerous condition in the future.

Severe head symptoms continuing as long as in this case are not infrequent after serious damage to the brain, such as often accompanies extensive fracture of the skull, and recovery from this condition is not unusual; but it is certainly uncommon to have the symptoms disappear so suddenly. The house surgeon, Dr. Love, states that the immediate return to a rational condition was startling. It is well not to be pessimistic in casting a prognosis in cases of this kind, for recovery may take place even in those which appear to be most hopeless

THE ORBITAL ROUTE FOR REMOVAL OF THE SECOND BRANCH OF THE FIFTH NERVE AT THE FORAMEN ROTUNDUM.

BY ANSEL G. COOK, M.D.,

OF HARTFORD, CONN.,

Surgeon to the Hartford Hospital.

THE superior maxillary, or second division of the fifth nerve, leaves the cranium through the foramen rotundum. It then crosses the sphenomaxillary fossa, enters the orbit through the sphenomaxillary fissure, traverses the infra-orbital canal in the floor of the orbit, and appears upon the face at the infra-orbital foramen, where it divides into a number of branches, which spread out upon the side of the nose, the lower eyelid, and upper lip.

Neuralgia caused by disease of this nerve or any of its branches can be cured, in many instances, by section of the nerve where it leaves the cranium at the foramen rotundum, and complete removal of the whole nerve peripheral to the foramen.

A simple, safe, and efficient method to effect this was originated by the late Dr. Melancthon Storrs, of Hartford, Conn., who cut the nerve on the outside of the foramen rotundum, removed a section of an inch and a half, and brought the distal end of the nerve into the mouth, between the alveolus and the upper lip, leaving the divided ends of the nerve some three inches apart, and the lower portion turned in a direction away from the upper. It is inconceivable that these divided ends could ever reunite.

Dr. Storrs was a surgeon of more than local reputation, whose skill and judgment were respected throughout the State of Connecticut. His exact technique in performing this operation is not well understood. His idea was always the same, but his method of operating different in different cases. He perfected his methods and his special instruments as he gained greater experience.

The operation which I am about to describe may be relied upon as the perfected Storrs's operation.

I had the honor of assisting Dr. Storrs three times at operations on living subjects, and spent considerable time with him in devising and remodelling instruments, in experiments on the cadaver, and, finally, at his request, I did the operation on a cadaver, under his eye, that he might satisfy himself that I thoroughly understood it, and that the knowledge of his method would not die with him.

Dr. Storrs operated on some ten or twelve patients, none of whom died, directly or indirectly, as the result of the operation. One woman lost the sight of an eye, but I have been told by her oculist that this was not owing to the operation, and that the pain did not return.

Two patients whom I knew personally remained cured for over ten years. One has since died, and the other has had no return of the pain. I have heard that three or four of the patients had some recurrence of pain after two or three years, but to what extent it is impossible to say accurately. I have investigated the case of one patient who was said to have relapsed, and found that he had suffered severe pain in other nerves, but not in the second division of the fifth nerve, which Dr. Storrs removed.

A well-known case was that of the late Roland Mather, of Hartford. Mr. Mather was seventy-six years old, had suffered severely for fourteen years, and had consulted many physicians at home and abroad. It is safe to say he had tried everything but an operation.

Dr. Storrs operated on Mr. Mather in November, 1886. The cure was complete. Mr. Mather died in May, 1897.

In the three years which have elapsed since Dr. Storrs's death, I have had but one opportunity to perform the operation, which I did successfully at the Hartford Hospital in December, 1902. The patient was a woman of sixty, who had suffered for one year, the last four months of which she was in constant agony. The operation gave her immediate and absolute relief, which has continued up to the present time.

A description of the operation is as follows:

Technique of the Operation.—Place the patient half reclining in a rocking-chair, wedged with sand-bags. The operator seats himself on a stool facing the patient, on the side of the eye on which he intends to operate. One assistant is necessary to give the anæsthetic, and a second to hold the retractor.

The lower edge of the orbit can be easily felt through the skin. Make a clean incision along this edge, from the inner to the outer angle of the orbit, through the tissues, including the periosteum, down to the bone. Then with a blunt instrument carefully elevate the periosteum from the floor of the orbit, going well back and exposing the sphenomaxillary fissure. Lift the eyeball out of the way with a spoon-shaped retractor inserted under the periosteum. Usually a bluish spot will appear, showing the situation of the infra-orbital nerve, covered by a thin plate of bone, in its canal in the floor of the orbit. Should, however, there be any difficulty in locating the nerve, it can easily be done by passing a probe into the infra-orbital foramen and up into the orbit. Having located the nerve, with a chisel or any suitable instrument crush the thin plate of bone covering it. The nerve can then be easily hooked up and brought to view. The infra-orbital artery is usually torn at this time, and bleeds for a few moments; but it is of no importance, and will soon take care of itself.

Having hooked up the nerve, ligate it securely with a piece of silk passed around it with an aneurism needle. Then cut the nerve, leaving the ligature fastened to the proximal end of the cut nerve. We now have the nerve under perfect control. By making a slight traction on the ligature, we can bring the nerve into view, and by following it on can readily crush down the thin wall of the canal, removing the bone fragments with suitable forceps. When the nerve enters the sphenomaxillary fissure, it passes out of the bony canal, and is only surrounded by soft structures, which can easily be hooked or wiped away.

Should the sphenomaxillary fissure be narrow, and not readily admit the introduction of instruments, it can easily

be widened by inserting a suitable blunt instrument, and by wedging or widening the walls. It is remembered that the upper wall of this fissure is the strong wing of the sphenoid bone, and that the lower angle is the thin wall of the antrum. If either bone should break in these manipulations, it would be the wall of the antrum which would be crushed down and out of the way, and would cause no trouble.

Having the nerve thus free to the foramen rotundum, next slip the ends of the silk ligature through a loop of wire, held with a small snare. (The Jarvis snare of the rhinologists.) The loop of wire in the snare is passed down the nerve to the foramen rotundum, just as a tunnel sound is passed over a filiform bougie. When the loop of wire reaches the foramen rotundum, it is closed, and the nerve is cut and removed.

To return now to the distal end of the nerve. Separate the integument from the bone down to the infra-orbital foramen, gather up with a hook the mesh of nerves going to the cheek, and drag the divided nerve through the foramen. Storrs then put the nerve into the loop of a threaded needle and carried it down into the mouth, leaving the end which had been in the infra-orbital canal suspended between the alveolus and the upper lip; this end he cut off even with the mucous membrane. This was for the purpose of preventing any possible restoration of any communication between the peripheral branches of the nerve and the stump left at the foramen rotundum.

To complete the operation, place a small gutta-percha tissue drain in the track of the nerve, extending from near the foramen rotundum to the surface. Suture the skin wound. The drain should be removed at the end of twenty-four hours.

In behalf of this operation, I would say that it is very safe, simple, and can be performed on elderly and feeble people with but little shock. The relief is immediate in all cases, and a permanent cure is effected in many. The scar is insignificant, and the patient is not confined to his bed for more than a week.

Its exact value can only be determined when more patients have been operated on and the results more carefully noted.

I. TUBAGE OF THE PHARYNX FOR FACILITATING THE ADMINISTRATION OF ANÆSTHETICS AND PREVENTING THE INHALATION OF BLOOD IN CERTAIN OPERATIONS ON THE MOUTH AND FACE. II. A HOT-WATER BED FOR THE OPERATING TABLE.

BY GEORGE W. CRILE, M.D.,
OF CLEVELAND, OHIO.

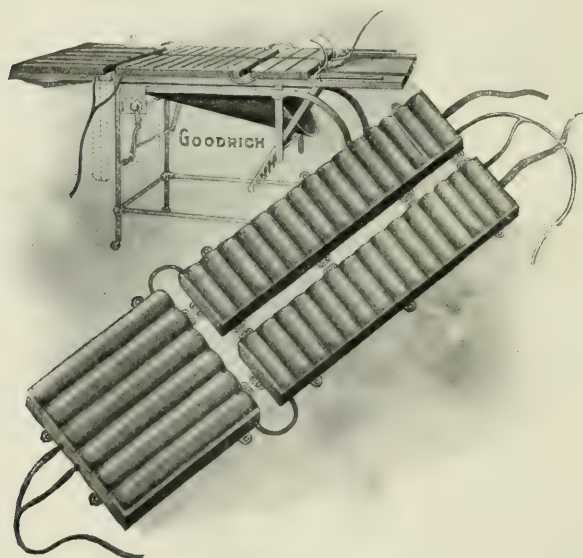
I. IN operations within the mouth, on the jaws, and on the nose, two distinct difficulties are encountered,—the prevention of the inhalation of blood, and an even administration of the anæsthetic, without encroaching upon the field of operation. For about a year the following method intended to obviate both difficulties has been employed:

1. The patient is reduced to full surgical anæsthesia.
2. The pharynx is cocainized.
3. Two drain-tubes as large as possible are passed through the nares to the level of the epiglottis; the tubes are then severed at an equal distance from the nose.
4. The mouth is well opened and the tongue drawn out.
5. The entire pharynx is then packed with rather large pieces of gauze.
6. If thoroughly done, the base of the tongue is carried well forward, and an air-chamber with which the rubber tubes and the larynx communicate is thereby formed.

The anæsthetic is administered entirely away from the field of operation. The patient may be placed in the position most advantageous for the operative technique regardless of the blood. In operations upon the tongue, the pressure against the base is sufficient to control most of the hæmorrhage until the lingual arteries are severed. In cleft-palate operations, not only is there no spraying of blood and mucus, but the field of operation is kept much cleaner. The mucus that usually

forms in the throat is absorbed by the gauze. The anæsthetic may be as evenly administered as in operations upon other parts of the body. A funnel may be attached for still further facilitating the administration of the anæsthetic.

II. The meagre protection of patients against damp and cold during operations constitutes a weak point in the management of surgical operations, particularly in the winter and spring time. In my own service I have encountered a number of cases of pleurisy, bronchitis, and a few cases of pneumonia following operations. The greater portion of these



Hot-water mattress for operating table.

could be attributed to the operation only so far as the patient was subjected to exposure to cold and damp.

Aside from these sequelæ having more or less risk to life, a great many patients have complained of pain and stiffness in the muscles of their backs following operations.

In conjunction with the Goodrich Rubber Company such a water-bed was devised. This bed is made of the best quality of rubber, in many compartments, so as to fit the top of the

table and permeate all the various points without interference. The tubing attached to the hot-water bed is so arranged that it may be attached to the hot-water tap, and a flow of hot water directed through it and drained from the other end.

A number of useful suggestions were made by my operating-room nurse, Miss Pringle. It was found best on the morning of operations to allow hot water to circulate freely through the rubber bed for half an hour or more, thereby warming the entire top of the table. It was not found necessary to have a continuous flow of hot water during operations, since a previous warming and a generous filling of hot water prior to the operation were sufficient to keep up a good temperature for several hours.

This bed has been in use in Lakeside Hospital during the past year. It is certain that during that time patients were less chilled, and the postoperative sequelæ alluded to above were apparently considerably lessened.

THE DROWNING OF PATIENTS IN FÆCAL VOMIT DURING OPERATIONS FOR INTESTINAL OBSTRUCTION AND SEPTIC PERITONITIS.¹

BY E. WYLLYS ANDREWS, M.D.,
OF CHICAGO.

A PATIENT may be killed by drowning in fæcal vomit while unconscious on the operating table or semiconscious after anæsthesia. The utter collapse which follows ileus of any origin favors this accident of flooding the air-passages, so that it probably occurs rather often. I do not wish to invoke this as a sole cause of sudden death or to ignore such other causes as toxæmia, myocarditis, embolism, or pulmonary œdema, but will describe two plain cases of death by suffocation which I have seen myself.

CASE I.—A young man, aged eighteen years, patient of Dr. McGaughey, was operated upon at Mercy Hospital for acute suppurative appendicitis. The general peritoneum was infected, and a large amount of pus was removed, after which the cavity was irrigated and a Mikulicz gauze drain inserted. This patient was returned to his room in fair condition. About fifty or sixty minutes after the operation I visited his room, where he had been attended constantly by a nurse. His consciousness had returned, and nothing unusual had occurred until, a moment before I chanced to reach his bed, he choked a little and ceased breathing. He was cyanotic and gasping as I entered, but did not vomit or retch. The pulse was full. Separating the teeth and drawing the tongue forward, I found his nose and mouth full of fluid fæcal vomit. None had escaped, and there was no cough. I lowered the patient's head by hanging his shoulders over the side of the bed, when large volumes of brownish fluid ran in streams from his mouth and both nostrils. When this ceased running, his body was rolled, and then still more elevated and artificial

¹ Read before the Chicago Surgical Society, March 2, 1903.

respiration kept up. The pulse soon ran down, and he died without ever breathing naturally again, or seeming to get any oxygenation from the forced breathing. He was practically dead when I saw him, although the heart beat a moment longer. Such a death might have been thought due to the anæsthetic had it occurred on the table. Of course, it is possible to assume that it was a cardiac case or a pulmonary embolism, and the flooding only an incident, but I believe it to be one of drowning, for reasons stated below.

CASE II.—An infant patient of Dr. McCleary had complete mechanical obstruction, for which I was called to operate, my diagnosis being intussusception of the ileocæcal valve. While making preparations for this operation about twelve hours after the obstruction began, slight cyanosis and choking were noticed in connection with fæcal vomiting, which was rather constant. About sixty seconds after the patient was laid upon the table, and almost with the first breath of ether inhaled, the patient ceased breathing and became suddenly cyanotic. The pulse disappeared, and, when the body was inverted, immense quantities of brownish fluid ran from the nose and mouth. Artificial respiration failed to restore this patient. An autopsy was then made, and an easily reducible invagination found at the valve.

Dr. L. A. McArthur allows me to quote two instances of drowning by vomit in his service at Michael Reese Hospital. One of these occurred at the beginning of anæsthesia, and the other just at the moment of making the abdominal incision. Both died quickly, with sudden failure of respiration and an immense outpouring of fæcal fluid from the nose and mouth, so that the operator was convinced that they were cases of suffocation or drowning. Dr. A. D. Bevan has kindly furnished me with another instance of this accident. This death occurred during an operation for gastro-enterostomy under chloroform anæsthesia, the patient dying on the table with the air-passages flooded with brownish fluid, which he apparently had lost the power of expelling.

I am also indebted to Dr. William E. Morgan for three typical cases seen by him. One, a corpulent man, during operation for intestinal obstruction, suddenly regurgitated a fluid

of brownish color, which was drawn into his trachea, causing quick suffocation. I chanced to be present and saw this death. A second case was one of gastric carcinoma operated upon by Drs. Fenger and Morgan which died on the table by this same outpouring and drowning accident. The stomach had not been washed out. A third case of Dr. Morgan's, while being operated upon in a suburban town for bowel obstruction, had, to quote his language, "a faecal explosion," strangled, and died on the table with the lungs full of the fluid vomit.

I am now, therefore, more than ever confirmed in the belief that this accident of drowning is an ever-present danger in septic laparotomies. The mechanism of this accident seems to me to be as follows: We will assume that the careful surgeon has washed out the stomach in these cases, yet starting with an empty stomach does not insure its remaining empty. Nothing has impressed me more than the enormous collections of fluid in large and small bowel obstructions which accumulate in the intestine. I have observed this particularly in opening the abdomen in late cases of obstruction. Although everything taken by the mouth is vomited, still, in these cases, fluid accumulation goes on, so that the paralyzed and distended bowel contains much more liquid than gas. In a few cases where I drained the bowel by artificial anus or to facilitate handling, I have been amazed at the quantity poured out. Sudden access to the stomach from this great receptacle takes place, in my opinion, when the tonus of the pylorus and cardia is relaxed by extreme depression. Probably ether and chloroform toxæmia added to septic toxæmia abolish some reflexes ordinarily present, so that throat irritability is also lost, and no spasmodic expulsion occurs when the trachea and bronchi are flooded. Assuming this throat paralysis as probable, the ease with which a narcotized patient can be drowned in fluid vomit is appalling to consider.

The toxicity of this matter is so intense that even in the throat some absorption may take place, but, unless this poisonous influence is exerted locally, there is scarcely time for any

effect from it. The viscosity of the fluid, however, adds to its deadly, choking influence when it is forced into the smaller bronchi. There is scarcely any chance that such sticky, turbid matter can be expelled or drained out from the lung as pure water is known to do with changes of posture.

Conclusions.—1. Flooding of the air-passages by fæcal vomit is a real danger, and probably has caused many unexplained deaths. 2. Resuscitation is impossible or very difficult. 3. The fluid may flow by gravity through the relaxed stomach sphincters directly out of the intestine where it has accumulated in enormous quantities. 4. The accident occurs with great suddenness and with a stomach supposedly empty. The suffocation may be so complete that no outcry is made and may not be noticed by the attendant. 5. It may occur as late as an hour after anæsthesia, or at any time until consciousness is restored. 6. We have no evidence that it can occur during consciousness even *in extremis*. 7. After septic laparotomy, patients, when returned to bed, should be watched without even momentary intervals to full consciousness. 8. A suggestion made to me by Dr. McArthur, that as many as possible of such cases be operated under cocaine anæsthesia, seems to me sound in the light of the above report.

SPLENIC INFECTIONS.¹

WITH REPORTS OF TWO CASES RECOVERING AFTER OPERATION.

BY ALBERT L. STAVELY, M.D.,

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Gynæcologist to Garfield Hospital.

AN infection of the spleen may be directly traceable to the introduction of septic material from without the body, where the thoracic or abdominal wall is injured coincidentally with the spleen.

After a local injury, where the skin remains intact and the spleen is contused or lacerated and the patient does not succumb to hæmorrhage, the intestinal bacteria may migrate and cause infection.

Sirleo reports the case of a man who sustained a contusion of the left side, followed by pain. Some time later the patient developed symptoms of obstruction and died. There was a septic peritonitis and an enlarged spleen which was adherent by its lower pole to the angle of the colon. In the interior of the spleen was an abscess cavity which had opened through the peritoneum into the intestine.

Bardenheuer speaks of a suppurating hæmatoma which contained a floating spleen.

Xarewsky had a patient, a girl of thirteen, who, some time after being thrown violently against a wagon, developed pains in the abdomen and fever. Tumefaction became apparent over the region of the spleen, and an incision was made, with the escape of a large amount of fœtid pus. The spleen was found completely separated from its capsule and removed.

Lampe and Goffe refer to similar cases. A gastric ulcer by contracting adhesions may infect the spleen, and inflammations of any other of the surrounding organs or tissues may by contiguity cause the same result.

¹ Read before the District of Columbia Medical Society, January, 1903.

In fatal cases of infection, hæmorrhages into the splenic pulp are common.

An abscess may result from an imported infection through the septic embolus, from tuberculosis, from twisting of the pedicle, from extension of infection from a perinephric abscess, a pyothorax or pulmonary abscess, gastric ulcer, from the exterior through an open wound or from laceration without external injury, from adhesions to intestines, and from involvement with pyogenic organisms of necrotic areas, such as we find in typhoid fever. It is rare in malarial fever.

Chondhoory in 30,000 cases saw only three with splenic abscesses.

Among the very rare causes is appendicitis. Three references are found.

Routier, a month after an operation for general peritonitis of appendicular origin, opened a splenic abscess.

Hagen incised a large peri-appendicular abscess without relief of the general condition; a month later the patient developed pain in the left flank, and intermittent fever, due to the formation of an abscess of the spleen.

Roffe had a young boy with contusion of the spleen, with recovery. Six weeks later he operated for appendicitis and peritonitis. At the autopsy, which occurred shortly afterwards, he found an abscess in the spleen.

In the last case, appendicitis, as the direct cause, is a little in doubt, as there was a preliminary injury to the spleen.

A very unique cause is circumcision done for phimosis. Shortly after operation the patient had febrile symptoms and diarrhoea and, later, pain and swelling in the region of the spleen.

An abscess may be multiple or single. The multiple abscesses are the result of infected emboli and are generally situated near the surface. They may by coalescence form a very large abscess, and when this occurs it is generally found in the upper half of the organ. An abscess developing from some purely local infection is usually single, and may reach a greater development than is found in the embolic form.

There is another kind where the whole spleen, from the intensity of the infection, is converted into a mushy mass of blood pus and degenerated tissue.

The pus from a spleen is usually dirty red or chocolate colored and contains shreds of disorganized splenic tissue. This is found especially where the spleen is converted into a purulent softened mass.

On the other hand, it may be like ordinary pus. One operator described it as a bluish-yellow fluid.

The constitutional symptoms of splenic abscess are in no way different from those of other abscesses. There may be some confusion from the complicating symptoms of the general disease, of which the abscess may only be a local manifestation. The local indications—swelling, fluctuation, tenderness, redness, a peritoneal friction sound—may be present in part or whole. The pain, which is not always constant, may be severe, sharp, and radiating, or dull and rather diffused. The existence of pain indicates some peritoneal involvement, though simple distention of the peritoneum in a large abscess is considered a possible cause in the absence of adhesions.

In general peritonitis—pyogenic or tubercular—the peritoneal investment of the spleen is involved.

An inflammation of the splenic peritoneum or perisplenitis is due also to local conditions, among which are intestinal and gastric ulcers, empyema of the pleura, infarcts, abscesses, acute splenitis, torsion of the pedicle, and tumors. The peritoneum is dull and congested, and oftentimes covered with patches of lymph more or less organized. Adhesions to surrounding structures are usually present.

In suppurative perisplenitis the spleen is encapsulated by the peritoneum of the parts adjoining and bathed or floating in a purulent exudate. This is observed in tubercular diseases. When the perisplenitis has existed for a long time the capsule becomes much thickened.

Perisplenitis not involving the whole surface may exist without involvement of the splenic tissue, as in the case of Sutton, where an abscess, due to perforation of the colon,

formed, in which the spleen constituted part of the abscess wall.

The outlook in an undisturbed splenic abscess is bad. Rarely it undergoes inspissation and calcification. Exceptionally it burrows its way along the line of least resistance, and ruptures into the peritoneal cavity, causing fatal peritonitis, or, what is more common, it discharges into the bowel, stomach, lung, or kidney, and forces its way out through one of the avenues furnished by those structures.

A case of spontaneous rupture externally has been reported. The treatment is incision and drainage or splenectomy.

The treatment is ordinarily successful where the spleen has contracted adhesions to the parietal peritoneum. Of thirteen cases so treated nine died. Where the abscess was situated high up, Lauenstein in one case resected the ninth rib and opened the abscess with a cautery. Splenectomy has been quite successful, too. Nine removals are recorded, three for suppurative perisplenitis, and two died, or 22 per cent. The three perisplenitis cases recovered. With most of the others there were complicating adhesions.

Some of the reports are interesting. Stewart (*Southern California Practitioner*, 1898) removed a large adherent spleen full of embolic abscesses. The patient died.

E. Collin cites a case where an abscess involving the entire spleen ruptured into the pleura.

W. C. Howe (*Medical News*, Philadelphia, 1893, lxiii, 405) had a patient, a man aged twenty-one years, well-digger, who had severe pain in the left hypochondriac region, with marked bulging over splenic area and a temperature of 102° F. After two months of various treatments, including cold, poultices, and quinine, the abscess was incised and two quarts of shreddy pus set free. About two weeks later he had a copious purulent movement, and a week later coughed up large quantities of pus. He finally recovered.

Hagen reported a case of abscess where the remaining splenic wall was so riddled with small abscesses that he cu-

retted it away, leaving only a small stump of tissue at the hilum. There was almost no bleeding.

Reginald Harrison described a man, aged thirty years, who some time after a severe fall developed shooting pains and swelling of legs, temperature of 100° F., and dulness over base of lung on left side; in region of spleen there was an increased area of dulness with pain and tenderness. The urine was normal. Finally, a decided swelling was noted, and increase of temperature to $102\frac{1}{2}^{\circ}$ F., leucocytosis, and fluctuation. He began to pass pus in urine. After three aspirations, and a final incision and drainage and removal each time of a large quantity of pus, the man recovered.

A case which I wish to report in this connection was referred to me by Dr. Charles Collins. I have reason to believe the diagnosis was splenic abscess with perforation of the kidney and discharge of pus "per urethram."

The history is as follows:

Mrs. W., white, aged thirty-three years, married, has been living in Washington.

Family History.—Father died at age of fifty-six of Bright's disease; mother asthmatic, otherwise in good health; three sisters living and well. History of tuberculosis on mother's side, two aunts dying of the disease.

Previous History.—Had measles and whooping-cough. Menstruation began at thirteen, regular, and in every respect normal; for three years had leucorrhœa; has had two children, one born in 1899, living and healthy; never has had any abortions; in 1899 had frequent micturition with burning, which lasted about three weeks. Since then up to the present attack the urine has been to all appearances normal.

Present Illness.—About Christmas, 1901, began feeling weak and suffering with pain and cramps in epigastric region, and later in the small of the back. From this time to July 6 had pain also in the left lumbar region. She contracted, as she said, "a heavy cold on her lung," with little cough and expectoration, but had very severe pain in region of left kidney, and was compelled to go to bed. On July 10, 1902, she emptied the bladder three different times, and each time the contents presented the charac-

teristics of nearly pure pus. Two days later she noticed more pus. The patient grew weaker and more anæmic, and the pain in the side changed to a soreness. Did not menstruate in January, and since then it has been scanty or absent. Appetite very poor, bowels regular. Slight hacking cough, with some greenish or whitish expectoration.

Examination.—A very anæmic woman, fairly well nourished, abdomen rather full, most prominent part to left of navel in the hypochondriac region. Here there was a decided resistance, marked pain, and soreness; this extending around into the flank; resonance along lower part of thorax in the epigastrium, dulness laterally and behind. Bimanually an indistinct, rather firm mass can be felt. Cervix uteri was dilated to exclude the possibility of a purulent discharge coming from the uterus. Her temperature before the operation ranged between 100° and 102.5° F. After the operation it still persisted, but seldom exceeded 101° . Her pulse before the operation ranged between 110 and 135; afterwards it continued rapid, only once or twice going down to 100. For a short time her condition was precarious. The urine and pus showed no tubercle bacilli after several examinations. The urine before the operation was yellow, alkaline, cloudy, and with specific gravity of 1017, containing epithelium and numerous leucocytes. For the three days following the operation it contained fine and coarse granular and hyaline casts in varying degree. After that they disappeared entirely. There was also an increase of the amount of albumen.

The last analysis, made eighteen days afterwards, still showed a few leucocytes. A blood count made before the operation gave 3,543,000 red blood-corpuscles and 38,200 white blood-corpuscles. Hæmoglobin, 46 per cent. There were no malarial parasites. Her condition at the time of operation was very bad, and no attempt was made to catheterize the ureters. An operation was performed July 23, 1902. A preliminary median exploratory incision was made. A large adherent mass was felt in the left hypochondriac region. The right kidney was movable and was situated below the level of the navel. It was regular in shape and smooth, but a little large. Two or three enlarged glands could be felt under the liver near the common duct. They were deeply located and would not admit of easy removal. The incision was closed. The patient turned on her right side, and a lumbar opening on the left side

was made extending from the ribs downward about three inches. An abscess sac was entered, from which discharged over a pint of yellowish, slightly odorous pus containing some shreddy material. The cavity extended between four and five inches above the thoracic margin. Below, a somewhat irregular prominent mass of tissue could be felt, which suggested the upper pole of the kidney. No sinus could be found. The cavity was irrigated with salt solution and closed, leaving a large drainage tube in place for future discharges or irrigation. As much as possible was accomplished considering her weak condition, and no attempt was made to explore the kidney. About a month after leaving the hospital she showed some decided improvement. She had slight daily rises in temperature and was still weak and anæmic. Seen four months later, the improvement was marked. The temperature ranged within a degree of normal, the pulse was slower, and she had been out several times. There was an increase of thirteen pounds in weight, and the only unsatisfactory condition was the existence of a small sinus from which discharged a little pus, enough to require the use of a dressing.

The following case possesses much interest on account of several unique features. The diagnosis is a complicated one, consisting of displacement of the spleen, malarial hypertrophy, hæmorrhage, suppurative perisplenitis,—infective splenitis,—thrombosis of splenic vessels, and infarction.

The history is as follows:

Mrs. W., admitted to Garfield Memorial Hospital, July 30, 1900, aged thirty-two years, white, domestic, was born in New York, and came to Washington at the age of five years, and has resided here ever since. Has had measles and whooping-cough. At the age of sixteen she had a severe and prolonged attack of malarial fever of the tertian type. Since the first attack, which lasted three months, she has had a series of mild recurrences. At the age of twenty-five she had rheumatism, which continued for six months. She has always suffered from indigestion, but particularly during the last year, when she noticed pain and a feeling of weight in the epigastric and left hypochondriac regions after eating. This lasted for about an hour and a half and was attended with acid eructations, and often with a sense of suffocation

and palpitation. Menstruation began at sixteen. The periods have been regular, lasting from four to seven days, rather profuse, and unattended with pain. She has had four children, the oldest twelve, the youngest two years. All her labors were normal. After the birth of the third child, eight years previously, her physician called her attention to a tumor which was located on the right side of the abdomen about on a level with the crest of the ilium. The growth was hard, about the size of a base-ball, and seemed larger when she was lying down, and possessed some mobility. She observed no especial change in its size until a year ago, when it underwent a gradual augmentation, and during the last month had become very large. The tumor has always been tender under pressure, and wearing of corsets or tight clothing was impossible. During the last year she had felt sharp shooting pains through it at intervals. Coupled with these was a severe burning sensation in the upper part of her back. Four years ago she had severe paroxysms of hypogastric pain, lasting from ten to fifteen minutes, during which she had to bend sharply forward. She has grown weaker and lost flesh for several years, but this has been especially marked during the last one. About two weeks before admission, June 15, 1900, she was attacked with violent pains in the region of the tumor, which lasted a week. Three days before admission to Garfield Memorial Hospital there was a recurrence of the pain, which became most intense, and subsequently tenderness developed through the entire abdomen. Her appetite had failed, and for a few days she was unable to retain nourishment, vomiting shortly after attempting to eat. Now she is able to retain food, but has gastric discomfort and acid eructations, an unpleasant taste and offensive breath. The bowels are constipated. There is inability to pass water, and when the attempt is made she had severe tenesmus. Resort to the catheter is necessary. She has no chest pains nor cough, but there is an excessive dyspnoea and palpitation on slight exertion. She worries easily, is of nervous temperament, has occipital headaches, and sleeps poorly. The temperature on admission at 3 P.M. was $100\frac{3}{4}^{\circ}$ F.

Physical Examination.—She is emaciated, has a sallow complexion, and is very anæmic. On inspection of abdomen there is a marked projection of the right half. On palpation, the firm, smooth, slightly convex surface of an abdominal growth can be

felt, extending from the ribs into the pelvis. Laterally, it reaches well into the flank and over to the linea alba. There is no fluctuation, and pressure in front imparts an impulse to the hand held behind. The area of normal splenic dulness is absent. Heart, lungs, and liver seem normal.

Per vaginam; the outlet is relaxed, the cervix high and small, and the uterus is pushed backward. On the left vaginal fornix the examining finger meets a firm resistance, and by carrying it further to the left, it encounters a sharply defined edge. A diagnosis of the hypertrophied septic malarial spleen was made and splenectomy decided upon. Through the kindness of Dr. Van Rensselaer I assumed charge of this case, and with his assistance the operation was performed August 6, 1900.

Operation, August 6, 1900.—Upon palpating the abdomen after etherization, a decided change in the physical characteristics was observed. The hard, smooth mass was replaced by a fluctuating one, and only after firm pressure could the original tumor be felt beneath the fluid layer. It was evident there had been a rapid accumulation of some kind of fluid. A median incision about six inches long was made through these adhesive walls. The omentum was adhering to the anterior wall, but the adhesions were light. Upon stripping the omentum free from the bladder to which it adhered, there was a copious discharge of dirty chocolate-colored fluid, the whole amounting to about a quart. After the removal of this fluid the correct condition was observed. There was a large sac lined with yellowish plastic material and containing a very large softened, dark, and degenerated spleen. A few adhesions between the spleen and sac on one side were freed and the hand passed around to get an idea of the size. It extended from the pelvis to the diaphragm, occupying most of the right side of the abdominal cavity. The spleen shelved out so as to make it impossible to expose its pedicle, which was short. The attachment was to the right side of the spinal column. A number of short vessels, within a space of six inches, could be felt, constituting the pedicle. The method adopted was to pass a ligature on a carrier and make a deep tie, then to clamp the vessel on the spleen side and cut between. The first step was accomplished without hæmorrhage, and the next vessel was treated in the same way. After cutting these the spleen could be raised so as to expose the rest of the pedicle. There was no

bleeding. The remaining vessels, five or six in number, were ligated under direct inspection, and the spleen removed without further difficulty. An examination showed a complete thrombosis of the splenic vessels, and there was not a drop of fresh blood lost during the removal of the organ. After a thorough cleansing of the sac, a portion of the thickened omentum was removed and the edge stitched to the parietal peritoneum so as to shut off the perisplenic sac from the intestines on the right. A drain was established through part of the wound in front and a counter opening for drainage was made in the side. The spleen after removal weighed 944 grammes, or about thirty ounces.

The sudden access of fluid noticed before the operation was undoubtedly due to an escape from the spleen of old blood due to an injury inflicted during some manipulation.

This mixing with a small quantity of purulent fluid already present accounted for the changed condition. The loss of blood, too, easily accounts for the decrease in size of the organ. There were no complications apart from a little pain and vomiting during the first twenty-four hours after the operation. Her maximum pulse-rate was 130. The highest temperature before the operation was $102\frac{2}{5}^{\circ}$ F.; the highest after, 102° F. It reached nearly normal in ten days, and fluctuated a little after that for about six weeks on account of some continued suppuration of the sac. After the operation, no hope was entertained of her recovery on account of the evident septic condition of the thrombi; but she recovered. Seen a year later, the improvement was so marked it was difficult to recognize her as the same woman.

A careful blood count was made before and after the operation. The effects of removing a functioning spleen are to increase the number of white blood-corpuscles and decrease the hæmoglobin and red blood-corpuscles for a time. After a varying period, the normal proportions are re-established, everything else being favorable.

In our case the following counts were made:

July 31.	Red blood-corpuscles	3,584,000	} 179
	White blood-corpuscles . . .	20,000	
	Hæmoglobin, 83 per cent.		
August 2.	White blood-corpuscles . . .	23,550	
August 3.	White blood-corpuscles . . .	25,666	

August 6.	Day of operation:		
	Red blood-corpuscles	3,820,000	} 168
	White blood-corpuscles . . .	23,200	
	Hæmoglobin, 75 per cent.		
August 7.	Day after operation:		
	Red blood-corpuscles	3,888,000	
	White blood-corpuscles . . .	24,308	
	Hæmoglobin, 75 per cent.		
August 8.	Red blood-corpuscles	3,044,000	} 184
	White blood-corpuscles . . .	16,466	
	Hæmoglobin, 65 per cent.		
August 9.	Red blood-corpuscles	4,003,920	} 240
	White blood-corpuscles . . .	17,094	
	Hæmoglobin, 65 per cent.		
August 11.	Red blood-corpuscles	4,580,000	} 384
	White blood-corpuscles . . .	11,916	
	Hæmoglobin, 80 per cent.		

The count showed a good deal of fluctuation.

The last count made was on September 27:

Red blood-corpuscles	4,176,000	} 344
White blood-corpuscles . . .	12,125	
Hæmoglobin, 80 per cent.		

These counts are not consistent with those obtained after the removal of a functioning spleen, and this is due to the fact that that organ was infected and non-functionating. Instead of an increase of the white-blood-cells and a decrease of the reds, the opposite occurred.

The hæmoglobin percentage was reduced about ten points to 65 per cent. for a few days.

The drainage tracks closed after several weeks.

The following is the pathological report, for which I am obliged to Dr. T. B. Nichols.

SEPTEMBER 5, 1900.

The spleen removed by operation from L. W., August 6, 1900, had approximately the shape of the normal organ, but was greatly enlarged to four or five times its normal size, weighing 944 grammes (about $31\frac{1}{2}$ ounces) and measuring 23.7 by 11.9 by 6.8 centimetres ($9\frac{1}{2}$ by $4\frac{3}{4}$ by $2\frac{3}{4}$ inches). It was soft and friable in consistency, and was intensely engorged and distended

with blood throughout its substance; its larger vessels, both arteries and veins, were filled with thrombi.

Microscopical examination shows the parenchyma and retiform spaces of the organ to be infiltrated and greatly distended with a massive extravasation of blood, with some hypertrophy of the retiform framework.

Cultures from the organ yield growths of the *staphylococcus pyogenes albus* and *bacillus coli communis*.

A case reported by J. Collins Warren bears a close resemblance to the one just described, minus the perisplenitis. Splenectomy was performed by F. B. Lund for rupture of an infarcted spleen. A man, aged twenty-six years, was taken to Boston City Hospital suffering with severe epigastric and left side pains, which were really aggravated by the lifting of a heavy basket. He had had attacks less severe for several months, was thin, anæmic, restless, groaning, and thirsty. He had an anxious expression, moist skin, and dry tongue; vomited a greenish fluid. There were some abdominal distention and epigastric tenderness. Free fluid and increase of dulness over splenic area; temperature, 101° F.; pulse, 124.

Diagnosis of peritonitis probably due to gastric ulcer was made and operation performed. About two quarts of blood were emptied out and a large ruptured infarcted spleen removed. The splenic vein was filled with a thrombus. After thorough washing of abdominal cavity and leaving in salt solution, the incision was closed. The man died on the fourth day. At the autopsy, a thrombosis of the portal vein, extending into the splenic, and a similar condition in a vein along the greater curvature of the stomach were found.

The most frequent cause of complete infarction, torsion of the pedicle, was not present in Lund's case nor in ours.

The rupture is easily explained by pressure against or other injury to a softened and distended spleen. In our case there was no distinct rupture of the capsule. It was more like an extravasation.

PRIMARY TYPHOIDAL PERFORATION OF THE GALL-BLADDER.¹

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OF NEW YORK,

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THE term *primary* is used in this article with a view of eliminating all cases of typhoidal perforations of the gall-bladder secondary to perforation of the intestines; in other words, only those cases are considered in which it is positively demonstrable that the ulceration and perforation began within the gall-bladder.

On October 22, 1902, I saw a case of Dr. Griswold's, during his absence from Greenwich, with Drs. Piatti and Clark, of the same place, in which the diagnosis of a perforation of the intestine had been made, occurring in the sixth week of typhoid and during the first week of convalescence. The history of the case was a clear one of typhoid, and is as follows:

Female, aged forty-six years; married, mother of several children; passed through a typical prodrome, which was followed by a five weeks' course of unquestionable typhoid fever. The eruption, although scanty, was evident and unmistakable. Head-aches, enlargement of the spleen, character of stools, abdominal distention, dry, coated, and fissured tongue, delirium, followed by manifestations of exhaustion, subsultus tendinum, and carphologia, presented a clinical picture that, even without the typical temperature, as shown by the chart, could be taken but for the one thing, typhoid fever. During the period of her third and fourth weeks a left-sided phlebitis developed. Two attacks of pain in the back, described as being between the shoulder-blades, were present in the third week, but at no time, according to the chart, were there any other symptoms present suspicious enough to call any attention or notice to the gall-bladder. Her temperature reached a normal plane at the close of the fifth week. On

¹ Read before the New York Surgical Society, February 11, 1903.

October 21, the day before I saw her and about the second day of her sixth week, convalescence was sufficiently advanced to allow her to sit up in bed. On the night of this day, at ten o'clock, she was seized with a severe pain in the abdomen, which required several hypodermics of one-fourth grain of morphine before any comfort was obtained. The site of this pain was not specialized as to its onset location when I saw her. She suffered considerable shock, and when seen by me, exactly twelve hours after the onset of pain, presented, in addition to those accompanying a protracted illness, the following symptoms: anxious countenance, pulse 120, respiration rapid, temperature 102° F., abdomen somewhat distended, exquisitely sensitive all over, but more marked on the right side.

Although rather later than usual for a perforation of the intestine, it was concluded best to explore the right iliac fossa. This was done by an incision through to right rectus. Upon incising the peritoneum there was a gush of bile-stained, cloudy fluid, with no odor and no food particles, through the opening in the abdominal wall. Our tentative diagnosis of perforation of the intestine was then changed to that of a probable perforation of the duodenum or gall-bladder; at the same time, all the small intestines were carefully gone over before extending the incision. Fully a pint of bile-stained fluid was sponged out during the process of inspection of the intestines and the enlarging of the incision. The gall-bladder and duodenum were easily exposed, and then it was seen that an opening, irregularly circular, fully one-quarter of an inch in diameter, was present in the lower portion and inner aspect of the gall-bladder near the cystic duct, through which clear bile was flowing. The gall-bladder on its outer aspect presented no other inflammatory manifestations, nor was it evident that it had been enlarged previous to the perforation. The mesentery and intestines were deeply stained with bile and were very friable, the peritoneum tearing upon the gentlest handling.

I decided to do a cholecystectomy. This was very easily accomplished, the hepatic attachment being separated, owing to the very friable condition, with the greatest ease. A double catgut ligature was passed about the cystic duct, the bladder excised, and the mucous membrane presenting in the stump brushed with pure carbolic acid; a gauze drain leading down to the stump, and also a gauze packing on the very freely bleeding hepatic

surface from which the gall-bladder had been removed, was employed. The peritoneal cavity was sponged out with salt solution and gauze pads. The abdominal wall was then closed, except at the point of exit of the drain and at its lower angle, where another gauze drain passed into the iliac fossa and pelvis. This latter drain was removed in three days. The drain and packing in the region of the stump were removed at this time, but another small drain was placed in this opening. A perfect recovery and complete union were recorded in three weeks. Upon closer investigation after the operation had been done, we were told that her onset of pain was situated at or about the usual surgical location for gall-stone colic, and that the general abdominal pain appeared at or about the end of the sixth hour.

Upon opening the gall-bladder, two small stones, so small as not to be considered factors in the cause of the ulceration, were found. The mucous membrane presented numerous small ulceration areas, and no opening was found to correspond to the opening seen on the peritoneal surface. There was a small ulceration area, about the size of the head of an ordinary pin, in the mucous membrane at a point almost directly through from that of the peritoneal opening, and, upon passing a probe into this opening, it was found to pass obliquely through the gall-bladder, making its exit through the peritoneal orifice, giving one the reversed picture of the funnel-shaped perforating ulcer usually seen.

Cultures taken from the contents of the peritoneal cavity and from the gall-bladder showed the colon and typhoidal bacilli.

I am indebted to Dr. W. W. Keen, of Philadelphia, for a number of references relative to this subject, rendering me thereby great assistance in the statistical part of this paper. In his book, "Surgical Complications and Sequels of Typhoid Fever," 1898, under the subject of "Gall-bladder Perforations," the statistics of thirty cases are recorded. I present with his assistance a record of three more, which, with my own, makes thirty-four cases, with four recoveries and thirty deaths, and append a brief record of each of these additional cases.

CASE I.—*Bolog. Gaz. Bot.*, No. 41, 1902. Gundeher.—Sex and age not given. Symptoms of perforating peritonitis on the twelfth day of

disease. Laparotomy performed; no evidences found. Cavity drained. Death in short time. Autopsy, gall-bladder found to be perforated.

CASE II.—*Lancet*, April 22, 1899, p. 1090. B. F. Anderson.—Male, twenty-seven years old. Diagnosis not made, as no symptoms directly warranted it; not operated upon. Autopsy showed perforation near the cystic duct. About third and fourth week of disease. No stones were found.

CASE III.—*Medical Chronicle*, January, 1901, p. 269. R. W. Marsden.—Male, seventeen years old. Pain in lower abdomen about the close of the second week. Operation performed, but, owing to collapse, the operation was discontinued after the peritoneal cavity was sponged clear of some greenish mucoid fluid, chiefly situated in the right flank. Death in nineteen hours after operation. Autopsy, numerous small mucous ulcers found, and a perforation at the fundus. No stones.

One of these cases, II, was a non-operative, and the others, I and III, were operated upon, but in neither of these was a complete operation done; all died.

Adding these three cases and my own to Dr. Keen's table, we then have the following record of twenty-five cases, in which the sex was recorded:

Under fifteen years, nine; recovered, one; died, eight.

Between fifteen and twenty-five years, six; recovered, none; died, six.

Over twenty-five years, ten; recovered, three; died, seven.

Of these, twelve were females and thirteen were males. The four cases that recovered were operated cases.

Time of onset: During the first week, one; second week, five; third week or later, twenty-one.

Of seven cases operated upon, four recovered and three died. Of twenty-seven cases not operated on, all died.

Stones were found in eight cases, while in seventeen no stones were found.

Of the seven cases operated upon, the perforation was near the cystic duct in three instances, in the fundus once, and the others not stated.

Diagnosis.—This can only be approximately made by obtaining a very thorough and careful anamnesis, particular stress being placed upon the original site of the pain, and remembering that pain in the gall-bladder region may indicate

perforating ulcer of the stomach at its duodenal end or of the duodenum itself, of the gall-bladder, and also the pain of acute pancreatitis, etc.

Treatment.—There can be no question as to what course to pursue in these cases, when we consider that of seven cases operated upon four recovered, while in the non-operated cases, twenty-seven in number, all died.

I prefer the incision through the rectus muscle rather than the one at its outer border or in the median line, as the exposure is without question the best with this incision, and the after possibility of hernia is reduced to a minimum.

The question with me as to what to do when a perforated gall-bladder is found is summed up in one word,—cholecystectomy. With our present knowledge of the necessity or not of a gall-bladder, particularly one that is diseased, the sacrifice of this viscus cannot give us one moment's unrest. Nevertheless, the condition of the patient and the surrounding viscera must weigh some in the matter of the disposition of the perforated gall-bladder; cholecystotomy and drain when cholecystectomy is not possible. The repair of the perforation in the gall-bladder by suture is unwarranted, first, owing to the marked friability of the tissues in these cases, and, secondly, the same objections arise as in the radical or ideal operation of cholecystotomy, *i.e.*, cholecystendese.

Recently, L. Baldassani and A. Gardini (*Münchener medicinische Wochenschrift*, 129, 1902), as a result of experimentation upon animals, advise the use of a musculo-peritoneal flap from the abdominal wall in such a manner as to bring the muscular layer on the inside of the bladder. I am quite satisfied that this method of repair will never be put to any but an experimental use, and that in lower animals only.

Prognosis.—As stated above, seven cases operated upon resulted in four recoveries and three deaths; two of the fatal cases reported by me as I and III, we can or should exclude, as incomplete operations were done. With a death-rate of one case out of five complete operations, we can certainly grant our patients and families a reasonable amount of assurance of the ultimate outcome of the operation.

RETROPERITONEAL HERNIA.

ACUTE STRANGULATION OF A KNUCKLE OF ILEUM IN A PERICÆCAL POUCH.

BY ALFRED BENNISON ATHERTON, M.D., LL.D.,

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FOR a year, a man, aged thirty-three years, had complained of more or less pain and soreness in his right inguinal region running across the lower abdomen. Three months ago he consulted me about his trouble, and as I could find no evidence of disease on physical examination, and as he had never been laid up and had lost no flesh, I came to the conclusion that he was neurotic, and sent him away with words of encouragement, merely. Subsequently, he went to see a clergyman who does a good deal of prescribing for the sick, and he told him he had appendicitis, and should be operated on for it. He therefore visited me again on September 24, 1902, and said, if I did not operate, he would go elsewhere for an operation. I thereupon consented; although I told him I could not find anything to warrant the diagnosis of appendicitis. No alteration in his previous symptoms or condition had taken place since he previously consulted me, but he said his trouble prevented him from carrying on his usual farm-work satisfactorily.

September 25, 11 A.M. Operation.—The anæsthetic being given by Dr. Weaver, and assistance rendered by Dr. Mullin, an incision was made in line of outer right rectus and an apparently normal appendix three and one-half inches long removed. Incision then enlarged so as to admit my hand, with which I examined the pelvis and hypogastric regions. I found one or two appendices epiploicæ of the sigmoid adherent in the pelvis. These adhesions were separated. Nothing further observed which was a deviation from the normal condition. Wound closed, and the usual dressings applied.

For the first twenty-four hours after operation, the patient seemed much the same as after any laparotomy case. Towards the end of that time, however, vomiting began to occur every few

hours, and increased in frequency the second day, although the pain did not seem much worse than usual. Thinking that a movement of the bowels would set things right, I began the usual turpentine enemata, small, frequently repeated doses of calomel, and gave, finally, an enema of Epsom salts, but all without avail. These measures were used for twenty-four hours or more, lasting up to the evening of the 27th. Meantime the vomiting became more and more frequent, and the pulse ran up to 112 or 115. The temperature had never risen above 99° F. Considerable abdominal distention had also appeared. During the third night the vomitus became distinctly intestinal in appearance and odor, and at morning visit on the 28th I found the temperature 100° F., and the pulse 136 and weak.

I now removed a few sutures, and about three drachms of dark blood-stained serum and a few bubbles of gas escaped. Then, after administering a little ether, I introduced a finger or two, and feeling a part of the bowel in the right iliac fossa somewhat harder than the rest, I pulled upon it, and out popped a knuckle of gut about two and one-half inches in length, quite black and with an opening near its middle one-third of an inch in diameter. The line of demarcation between the living and dead bowel was clearly defined, and the adjoining sides of gangrenous knuckle were united by easily separated adhesions.

I now resected eight or nine inches of the bowel, including the dead portion, and united the ends by two rows of silk sutures, the inner one mattress with the ends tied internally, and the outer a continuous Lembert suture. Iodoform gauze used for drain, and the usual dressings applied.

In spite of strychnine and brandy hypodermically, he gradually sank, and died the same evening at seven o'clock.

A hasty and slight post-mortem examination revealed a somewhat distended cæcum with the lower two feet of ileum collapsed. At this point the resected bowel was sutured. Above this the ileum was distended. No sign of old adhesions anywhere to account for the strangulation, but in the locality from which I pulled the gangrenous knuckle of bowel I found a pouch about an inch deep and having an opening of the same diameter. It was situated just to the outer side of the lower end of the cæcum and partly behind it. The stump of the amputated appendix was found half an inch to the inner and lower side of the pouch.

Remarks.—The rarity of strangulation of the bowel in one of these intraperitoneal pouches seems to me of itself to warrant the report of this case. Then, again, its occurrence after an ordinary abdominal section, and apparently as a result of it, makes it still more deserving of record.

The painful and uncomfortable feelings which led the patient to seek advice were probably due to the occasional entanglement of a loop of bowel in the pericæcal pouch. Sir F. Treves says that in some of these cases "long-continued intestinal uneasiness" has preceded the strangulation. I attribute the onset of the acute symptoms after the first operation to the occurrence of some distention of the bowels as a result of their having been handled considerably, and the consequent crowding of the loop of ileum into the pouch, where it became more distended, perhaps, through its incarceration, and was thus more firmly fixed there; while the further distention of the small intestine above the point of strangulation as well as the somewhat distended condition of the cæcum (which was found at the post-mortem examination) doubtless aided in preventing the escape of the entrapped knuckle.

It seems somewhat remarkable that complete gangrene and perforation should have arisen in about forty-eight hours after the symptoms of strangulation fairly set in, where the opening to the pouch was so large, and where the bowel was liberated with so little effort as I used to dislodge it. But no old adhesions or bands were found in the neighborhood, or anything else to account for the strangulation.

Finally, the history of this unfortunate case teaches us that we must bear in mind the possibility of at any time having to deal with such a rare condition.

A SUCTION APPARATUS FOR CONTINUOUS DRAINAGE.

WITH REPORT OF CASE OF INTRAPERITONEAL RUPTURE OF BLADDER.

BY KARL CONNELL, M.D.,
OF NEW YORK CITY.

OF the various modes of suction at our command, probably the simplest, certainly the cheapest and most convenient, exhaust is the hydraulic pump.

Sprenghel applied the fall of short columns of mercury through tubing to the laboratory exhaust which bears his name. As each column falls it forms a liquid piston, which propels the air ahead and tends to exert a suction behind proportionate to the weight of the column. In applying this principle to surgery, it is found that water presents a more convenient liquid of sufficient weight even in a short fall. It must be borne in mind that liquids have their limit of cohesion. If a definite column of water is run through a tube of large diameter, the velocity must be considerable for it to maintain its integrity as a piston; otherwise the adhesion to the tubing will overcome the cohesion of the water, which will then run down the side of the tubing instead of moving in a solid piston. Experimentation will demonstrate that perfect cohesion of water is limited to the three-sixteenths inch tubing. For instance, in one-fourth inch bore the bottom of our liquid piston is slowly but continually breaking away and trickling down the side of the tube. This waste increases with the diameter, until in one-half inch tubing we lose roughly three inches of our liquid column each second. A tube three-sixteenths of an inch then is to be selected as the bore combining maximum efficiency and economy.

To effect reliable automatic intermittence in the water supply to the tube by some device which will permit the "water

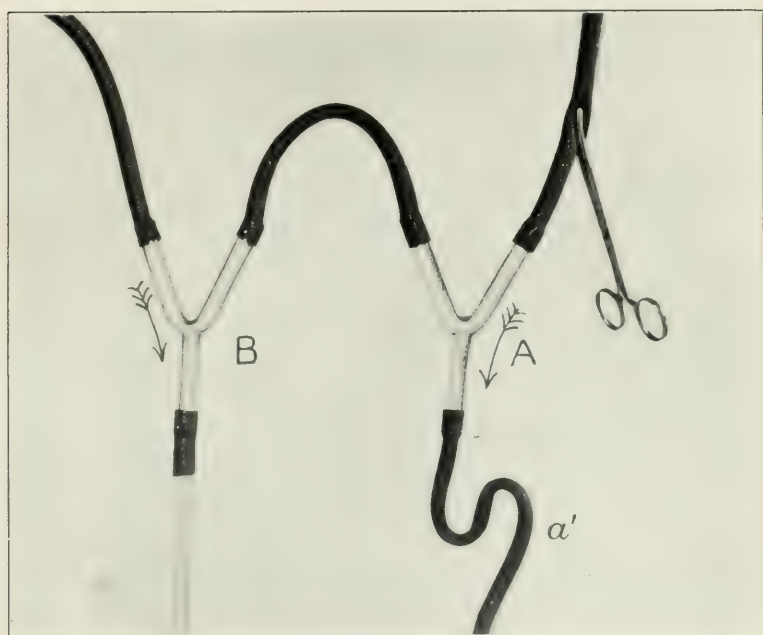


FIG. 1.—Connell suction apparatus for continuous drainage.

piston" to form is readily secured by placing a U bend or a loop (Fig. 1, *a'*) in the tubing, in which the water will collect until it has filled the U to overflowing, when the mass will siphon over and descend in a short solid column. There results a suction apparatus, the power of which is limited only by the vertical fall of the liquid after leaving the U and of a capacity utilizing four ounces of water per minute in a fifteen inch fall, or two gallons per hour, to aspirate ten ounces per minute; or using two quarts of water per hour to aspirate one and one-half ounces per minute of air or urine or bile or thin pus, which is well beyond any surgical requirement. This tube is now connected by a glass Y or some modification thereof; by one limb to the reservoir from which the water is slowly fed; by the other to the cavity to be aspirated. This completes a cheap, easily constructed, effective pump (Fig. 1, *A*).

A desirable refinement can be introduced in the form of a trap which will short circuit the aspirated material (Fig. 1, *B*). This is attained by throwing a glass Y with a long lower limb into circuit between the pump and the viscus being aspirated. The lower end of the Y must be submerged. A column of liquid will be sucked up into this stem, which will furnish an accurate gauge of the amount of suction. This trap will short circuit all aspirated material, permitting it to be measured and preventing fouling the pump and power water. In case of emergency it will also short circuit any reflux from a deranged pump which might otherwise back up onto the viscus being aspirated. This is the form of continuous aspirating apparatus which has been used at the New York Hospital for the past fifteen months as routine, where suprapubic drainage of the bladder is established. It has also been applied to aspirating the ureters and empyema cavities. By the continuous evacuation of bile from the gall-bladder following cholecystotomy with excessive discharge, it keeps the dressings clean and lessens the possibilities of intraperitoneal leakage and accumulation.

As illustrating further elaborations of intraperitoneal aspiration, of useful but less general application, Fig. 2 demon-

strates the original and more complicated form of the foregoing, which was devised by the writer when House Surgeon of New York Hospital under Dr. Francis H. Markoe, Attending Surgeon, in December, 1901, to meet the requirements of a case of intraperitoneal rupture of the bladder.

A. Bunsen pump constructed by inserting a fine glass tip into the side of rubber tube and constricting orifice at which water jet is thrown. This pump is of equal strength and greater capacity than Fig. 1, A, but is nicer of adjustment and liable to clog, hence less desirable.

B. Trap, gauge, and safety-valve.

It was considered desirable to establish continuous irrigation of the bladder in addition to continuous suction drainage in order to preserve intravesicular cleanliness and asepsis. This irrigation was secured as follows:

(2) C. Double current suprapubic tube, home-made, by dragging a small catheter through the side and lumen of a larger tube from the intravesicular end of which the smaller protrudes.

To preclude positive pressure from excess of irrigation, this was sucked up by the negative pressure created in the bladder by pump, A, from a level four inches below that of the patient's bladder; reservoir, D, kept warm by electric light, E, and of constant level by automatic siphon bottle, F.

Had not the integrity of the bladder been disturbed, and even slight positive pressure a menace to the long suture line of the intraperitoneal tear, these last features could have been eliminated, and the weak antiseptic solution run in under positive pressure. This latter would be the choice in cases such as tuberculosis of the bladder and chronic cystitis, where suprapubic drainage with continuous irrigation is desired.

The case of intraperitoneal rupture of bladder is one of unusual interest, and with the kind permission of Dr. Markoe it is appended, adding another to the twenty-two cases of such lesions reported in the past ten years, collected by Alexander (ANNALS OF SURGERY, August, 1901) and Jones (ANNALS OF SURGERY, February, 1903) in their recent memoirs in the ANNALS OF SURGERY.

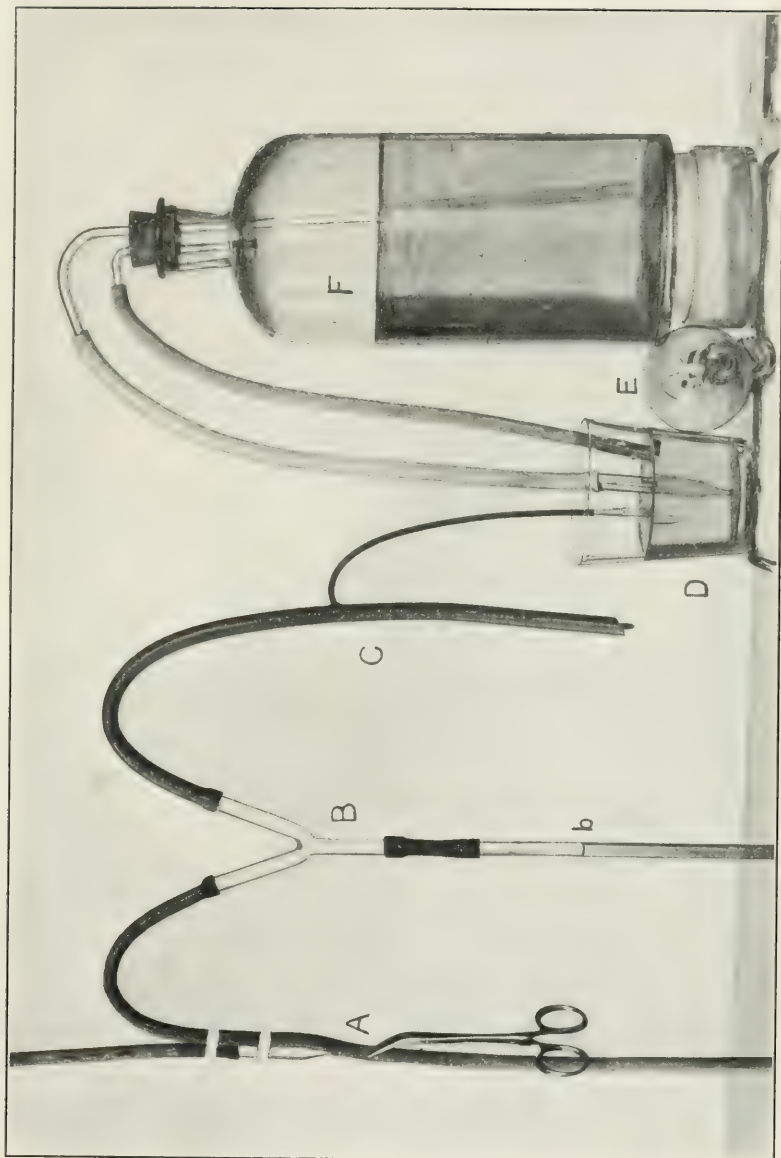


FIG. 2.—Connell suction apparatus for continuous drainage.

Joseph B., a German waiter, thirty-eight years of age, was admitted to the New York Hospital in December, 1901, with the history that, thirty-six hours before admission, while reeling home after drinking through the evening twenty to thirty glasses of beer and considerable whiskey, he had stumbled and fallen, his hands being in his side pockets, flat on his abdomen upon the smooth stone walk. He sustained contusions of the face, but otherwise seemed uninjured. Got up unassisted, and without further known trauma went to bed. Awoke fourteen hours later with headache; hæmatemesis, probably of swallowed blood; severe general pain in the abdomen, more in lower portion; vesical tenesmus, and inability to pass any but a little bloody urine. Emesis not repeated. Pain and tenesmus continued all day, followed by a restless night. Towards morning, twenty-four hours after injury, patient began to have slight passive incontinence of bloody urine, and had several slight shaking chills. Walked to the dispensary in the afternoon, where about eight ounces of very bloody urine was withdrawn by catheter; rupture suspected, and patient sent to the ward.

He was a well-developed man, mind active and rational, and alleged that he had only slight abdominal discomfort. Contusions of the face. Slight general cyanosis. Breathing mainly thoracic. Underwear stained with bloody urine. Abdomen moderately corpulent, no evidence of trauma, slightly rigid, moderately tender over lower portion, slight indefinite dullness in flanks. No fluid wave. Rectal temperature, 97.4° F.; pulse, 120, soft; respiration, 24. Leucocytes, 18,000.

Operation, Dr. Markoe, thirty-eight hours after injury. On preliminary catheterization, fifty ounces of bloody urine obtained. Through a suprapubic cystotomy a large rent could be felt in the fundus of the bladder. Incision enlarged upward and peritoneum opened. About a pint of urine and blood-clots turned out of the pelvis. Rent now evident in the bladder, which, with this viscus empty, extended in almost the median line from a point an inch behind the anterior reflection of the peritoneum to a point past the peritoneal reflection onto the rectum. Secondary to this and not coinciding in direction was a stellate tear in the overlying peritoneum, one limb of which extended forward, another backward and to the left a distance of four inches into the mesosigmoid, and a third extending backward and to the right. Peri-

toneum slightly injected. No peritonitis. The bladder was sutured by a single row of interrupted fine chromicized gut sutures, including the muscular coat. The peritoneal tear was sutured over this by continuous gut suture. The abdomen was cleansed with salt irrigation, dried, and closed, leaving a small wick of gauze into the vesicorectal pouch. A suprapubic drainage tube was inserted into the bladder and the superficial layers of the wound were partly closed.

Intraperitoneal drain removed second day, pelvis clean and fairly dry. Peritoneum closed by a stitch. Temperature ranged about 101° F., except for a transient rise on the second day, until the fourth day, when it rose to 104°, and leucocytes from 8000 to 19,000. Ran a septic course for several days together with signs of slight peritoneal irritation. Interpreted as a sapræmia from a blood-clot. Symptoms abated and further course was uneventful. Irrigation discontinued after a week. Smaller tubes substituted and aspiration discontinued on sixteenth day, after which fistula leaked for forty-eight hours. Wound healed completely by end of fifth week. Health has since remained excellent and urinary condition good, save that four months after discharge of patient, following the ingestion of two quarts of milk punch and several glasses of beer, he was afflicted with hæmaturia for several days.

PRIMARY CARCINOMA OF THE APPENDIX.¹

BY ALEXIS V. MOSCHCOWITZ, M.D.,

OF NEW YORK,

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REPORTS of primary carcinoma of the appendix in literature date back practically only to 1896. The few isolated cases recorded prior to that year are the results only of the systematic tabulation of extensive autopsy material (Nothnagel, Maydl, Leichtenstern). During the past six years, however, the casuistic reports have multiplied to such an extent that this disease must cease to be merely a medical curiosity, and, indeed, it was looked upon as such until the present; and yet, even when one includes all of the reported cases, some twenty in all, primary carcinoma of the appendix is still of sufficient rarity to merit the publication of all cases.

As yet the clinical picture of this disease is very meagre, and largely, if not wholly, obscured by the accompanying, more or less acute, inflammatory process. In view of the fact just stated, and also because, in the course of the past eighteen months, we had occasion to operate upon three cases of undoubted primary carcinoma of the appendix, it has occurred to the writer that it might be of interest to critically review all of the published cases in order to determine whether a definite clinical picture might be evolved. It cannot be said that my efforts in this direction have been crowned with much success; but, at all events, so many interesting and novel data have resulted from this work that I have deemed it of sufficient value and interest to publish them.

For the sake of completeness, I shall begin with the histories of our cases. As will be seen, the history of Case I and Case III are of unusual length; while that portion of the his-

¹ Read at a meeting of the New York Academy of Medicine, March 5, 1903.

tory which is directly related to the diseased appendix might be condensed into a very short space, it was deemed advisable to detail these two histories in full for the following reasons. In Case I, because of the preceding and subsequent gastric symptoms, which gave good cause, at least, for the presumption of a malignant metastasis in the stomach; in Case III, because of the accompanying pyrexia and serious condition of the patient, which, however, as will be seen, were due to causes entirely extrinsic to the appendix.

Case I and Case II were operated upon by myself, Case III by Dr. Gerster.

CASE I.—Isaac S., thirty-seven years old, married, and a saloon-keeper by occupation, was admitted to Mount Sinai Hospital on July 12, 1901. His family history is negative.

Past History.—Patient was well up to three years ago, at which time he began to vomit; at the onset he vomited as often as he took any food; but he never vomited any blood, the vomitus consisting only of the ingested food. At the same time he also complained of pain in the epigastrium, which remained localized, and did not radiate. After vomiting in this way for a year, he was admitted to the medical side of Mount Sinai Hospital, and was treated for fourteen weeks; he was discharged with the diagnosis, "alcoholic gastritis." After his discharge he visited various specialists abroad, but the vomiting persisted unabated up to the present, and, as was to be expected, the patient in consequence became greatly emaciated.

Present History.—On July 11, or one day prior to his admission to the hospital, patient was suddenly stricken with severe cramp-like pains all over the abdomen; very soon these pains became localized in the right iliac fossa; in addition, there was at the onset, also, a very severe chill, followed by high fever. The vomiting continued with increased force; his bowels were constipated. Patient also states that during the past few months he has frequently had severe attacks of abdominal pain, on an average once a month, to which, however, he attached no special importance, attributing them to his old malady.

Physical Examination.—General condition is good; patient is fairly well nourished, in spite of the past history; the face is



FIGS. 1, 2, 3.—Primary carcinoma of the appendix vermiformis.

flushed. With the exception of the abdomen, the physical examination was practically negative. The abdominal walls were held rigid, especially on the right side. In the right iliac fossa, and well to the outer border of the rectus, and about on a level with the iliac crest, there was to be palpated a small but very tender mass; percussion over the mass gave a dull tympanitic note. Nothing to be felt by rectal examination. Temperature, 101° F.; pulse, 72; respirations, 24.

The diagnosis of appendicitis, with general peritonitis, was made, and immediate operation proceeded with. Kammerer incision; on opening the peritoneum, free pus welled up into the wound from the general peritoneal cavity. The palpating finger discovered a mass low down over the outer half of Poupart's ligament. In this mass lay the appendix, twisted upon itself, its tip pointing towards the anterior superior spine, and buried in adhesions; it was freed and extirpated. Suture of the abdominal incision; drainage through the lower angle.

Autopsy of the appendix directly after its extirpation. The appendix is three inches long, much congested and swollen. At its tip, and embedded in its walls, there is a small, yellowish mass, about the size of a bean, which was firm to the touch, and apparently sharply encapsulated. Just below this mass there was an area of gangrenous mucous membrane, about half an inch wide, involving the entire circumference of the appendix. At about the middle of the appendix there was to be seen another patch of gangrenous mucous membrane about half an inch square (Fig. 1).

The wound healed kindly, being complicated only by the persistent vomiting and epigastric pain complained of for three years prior to the operation. It was but natural for us to think of a malignant growth of the stomach secondary to the carcinoma of the appendix; the stomach contents, however, showed an abundance of free HCl, and no mass was to be palpated, so that we felt justified in excluding this diagnosis. At all events, it was clear that there was evidently some pyloric obstruction present, and with this in view, Dr. Gerster operated on him August 5. A benign stenosis of moderate degree was found, for the relief of which a gastro-enterostomy was done. He left the hospital in good condition (the Murphy button not having passed, however), and remained well for two months thereafter, without vomiting, and gaining about twenty-five pounds in weight.

He returned December 4, 1901, with a recurrence of the old symptoms; these were ascribed to the presence of the retained button; the button was therefore removed by gastrotomy. This operation was exceedingly difficult, the button having been found tightly wedged in at the original site. To insure a patency of the anastomosis, a variety of the Heinecke-Mikulicz operation was performed on the gastro-enteric opening. Again he was discharged well, and remained so until his readmission on May 28, 1902, with a history of a recurrence of the vomiting. On examination there was found an epigastric and lateral ventral hernia. It was noted that, by pressure on the epigastric hernia, his vomiting was relieved; this led to the conclusion that the trouble was due to adhesions, for which I performed a radical operation for the cure of the epigastric hernia, sewing the different layers of the abdominal wall by layer suture. He was again discharged cured, but returned again December 22, 1902, with the old symptoms. I again operated for the cure of the lateral ventral hernia. At this operation, I examined carefully the site of the appendix and the neighboring abdominal cavity as far as allowable, and found absolutely no recurrence of the carcinoma. He was discharged January 14, 1903, with a cessation of his vomiting.

I have gone at some length into the history of this case; as already stated, this was done because there always exists the possibility of recurrence and metastases after the extirpation of a carcinoma, and I wished to disprove, as far as it lay in my power, its existence in this case.

CASE II.—Rosa P., twenty years of age, a tailoress by occupation, was admitted to the hospital on May 28, 1902. Her family and past history is negative in all respects. Ten days ago the patient experienced for the first time pain in the right iliac fossa; this pain has persisted with varying intensity up to the time of admission; she has had two chills, but apparently there was no fever; she has not vomited, and with the aid of cathartics her bowels have moved daily.

The physical examination was negative, with the exception of the abdomen; the abdomen was lax and tympanitic, but exquisitely tender to deep pressure in the right iliac fossa; no tumor was to be palpated. Temperature, 100.2° F.; pulse, 84.

The diagnosis of appendicitis was made, and patient was operated on May 30 through a McBurney incision. After open-

ing the peritoneum, and after severing some fine adhesions, the appendix was delivered into the wound and extirpated. Layer suture.

Autopsy of the appendix directly after its extirpation. The appendix was four inches long; its serosa is congested, and particularly at its distal extremity covered with a fresh, yellowish-red, transparent, gelatinous exudate, in which were to be seen a number of fine granules, not unlike those seen in actinomycosis. One inch from the tip of the appendix there is to be felt a hard nodule, approximately half an inch long and one-quarter of an inch in diameter, its long axis lying in the long axis of the appendix. On laying the appendix open, it is seen that in the proximal two and one-half inches the mucous membrane is hypertrophied, and occasional punctate hæmorrhages are to be seen in this area; the next half inch is occupied by a firm, yellowish tumor corresponding to the nodule felt from without; the distal portion again shows hypertrophy of the mucous membrane, but no hæmorrhages (Fig. 2).

The patient made a perfectly normal convalescence, and was discharged on June 21, 1902.

Patient presents herself from time to time for re-examination; as yet no recurrence or metastases are noted.

CASE III.—Dora G., twenty-four years of age, a housewife by occupation, was admitted to the hospital October 26, 1902. Her family history is negative. She has been married since May, and is now about five months pregnant; foetal movements have been felt for two weeks; prior to her pregnancy menstruation was normal.

The present history is of five days' duration; began with pain in the hypogastrium, and very frequent and painful micturition; this pain has continued without any remission. Has had a chill on the day previous to admission, and some fever; bowels have moved when aided by enemata. The foetal movements have either ceased entirely, or at all events have grown very faint.

Physical Examination.—General condition fair, well nourished; cheeks flushed; facies anxious; tongue dry and coated; throat reddened, but in other respects negative. No petechiæ; no jaundice, and no œdema to be seen anywhere.

Thoracic organs normal, excepting that the heart's action is

more rapid and overforcible; in addition, there was to be heard a rough systolic murmur over the pulmonic area, transmitted downward for a short distance.

The abdomen is considerably distended, but there is no sign of any effusion; there is some tenderness over both lumbar regions, particularly on the right side.

The liver percusses as if it were slightly enlarged; the spleen is not enlarged.

The uterus is palpable two fingers'-breadth below the umbilicus; the foetal movements are felt, but the heart sounds are not distinct. The os is soft, slightly patulous; both fornices are free; no vaginal discharge.

Rectal examination is negative.

The urine was cloudy, and deposited a sediment of half an inch on standing; it was acid, 1010, contained some albumen, no sugar; microscopically, many pus-cells, no casts.

On admission the temperature was 100.6° F.; pulse, 106; respiration, 28.

On October 27 the temperature rose to 104.8° F., with a corresponding increase in the pulse-rate. Examination showed the presence of a leucocytosis of 17,500; the absence of malarial organisms; Widal was also negative.

Between October 28 and November 3 there was daily a marked rise in the temperature up to 105° F. In the mean time the general condition has rapidly deteriorated; patient lost a great deal in weight; the face looked pinched; the tongue was dry and coated. In other words, a fatal termination was in outlook unless something was done. Practically, the only physical sign of any value which was present was the pain in the right side of the abdomen. An exploratory laparotomy was decided upon, and carried out on November 3 by Dr. A. G. Gerster.

Inspection revealed nothing pathological, excepting, perhaps, the tip of the appendix, which was adherent to the iliac fossa, and covered with a small amount of exudate; this was therefore extirpated. The uterus and uterine appendages were normal, and corresponded to the fifth month of pregnancy. The gall-bladder and bile passages, as well as the right kidney and pylorus, were inspected, and found to be normal.

Autopsy of the appendix directly after extirpation. The appendix was three inches long, and about the thickness of a lead-

pencil. At its tip there was a thickening which could be distinctly felt; several engorged vessels were seen crossing this bulbous portion in a longitudinal direction. On section it was found that the lumen was obliterated in the distal portion; in the proximal portion the mucosa was thickened. (In this case there was missing the apparent encapsulation of the tumor noted in the other cases.) (Fig. 3.)

The condition of the patient after the operation was hardly different from what it was before. She continued to run septic temperatures, had a rapid pulse and a high leucocytosis. The wound healed uneventfully *per primam*. In the mean time her general condition was becoming worse and worse; nothing further could be determined as regards the cause of the seriousness of her condition, except the possibility of an autointoxication as the result of her pregnancy. An artificial labor was decided upon, and this was performed by Dr. J. Brettauer, Attending Gynæcologist, on November 10; a healthy foetus was extracted, nor was anything found about the placenta or membranes which would account for her septic condition. At all events, she improved almost immediately after the artificial labor; the temperature and pulse soon dropped to normal; the general condition improved very rapidly, and patient was discharged, perfectly well, on December 4.

In this history I have also gone at some length, although in its careful observation the firm conviction was gained that the carcinoma of the appendix was only an accidental and incidental finding. It cannot, however, be denied that it was the presence of the diseased appendix, which early in the disease gave rise to those abdominal symptoms, which gave more than ample justification for the exploratory laparotomy, and for the extirpation of the appendix. Already during this operation it was recognized that the appendix, while justifying an extirpation, did not give rise to those severe toxic phenomena under which the patient labored, and this was confirmed by the subsequent course of her disease.

A fairly careful search of the literature revealed the presence of eighteen additional authentic cases of primary carcinoma of the appendix, viz., Jessup,¹ one case; A. O. J. Kelly,²

two cases; Hurdon,³ one case; Letulle and Weinberg,^{4, 5} four cases; Rolleston,⁶ one case; Mosse and Daunic,⁷ one case; Wright,⁸ one case; Goffe,⁹ one case; Whipham,¹⁰ one case; Stimson,¹¹ one case; Harte and Willson,¹² two cases; McBurney,¹³ one case; Lartigau,¹⁴ one case.* The three cases of Leichtenstern, Nothnagel, and Maydl are not included in this list. This does not by any means pretend to be a complete list of all the cases on record, but it is all that I could find after devoting considerable time to this search. No doubt there are other cases recorded; and there is reason to believe, as is usual in matters of this nature, that there are in existence a number of cases which have never been placed on record. At this point it may also be stated that, in looking over the recorded cases, the first point which strikes one is that the majority of these cases are of recent date. If we exclude the cases of Leichtenstern, Nothnagel, and Maydl, which happen to be merely accidental autopsy findings in a large statistical material, practically all the cases have been reported within the past six years. I am sure it is hardly necessary to remark that it would be manifestly wrong to base upon this fact the deduction that primary carcinoma of the appendix is growing more frequent; rather, that this pathological finding is being recognized more and more, now that the attention of pathologists and surgeons has been directed to it. Even now appen-

* Some time after this article was finished, I read de Ruyter's²⁰ article, "Ueber Carcinomentwicklung," in the *Archiv für klinische Chirurgie*, vol. lxxix, page 281. In this article a short *résumé* is given of the following case, to prove that chronic irritations play a rôle in the development of carcinoma.

The patient was operated upon six years ago for a recurrent appendicitis. The appendix contained a faecal concretion, and was developed with difficulty, but finally was resected and extirpated; numerous pericæcal abscesses were also opened and drained. Thereafter patient had a number of attacks of localized peritonitis, but finally recovered completely. He died six years later from pyæmia, which originated in a phlegmon of the leg.

At the autopsy there was found a small, apparently cystic tumor in the stump of the appendix, which on microscopical examination proved to be a colloid carcinoma.

dices removed, particularly in those hospitals in which a large number of cases are operated, are not examined microscopically as a routine procedure, or at best are examined only macroscopically, unless the gross pathological examination is such as to promise some unusual finding. That the gross appearance alone is not sufficient is well proven by the report of three cases (two cases of Harte and Willson, and case "b" of A. O. J. Kelly) in which absolutely nothing of a suspicious nature was to be seen macroscopically, and the true nature of the cases was recognized only after the more careful microscopical examination.

The number of cases is still by far too small to enable us to say anything regarding the frequency of primary carcinoma of the appendix. However, in view of the increasing reports of cases in recent years, I believe that we are fully justified in saying that primary carcinoma of the appendix is far more frequent than we are led to believe from the statistics of Nothnagel and Maydl, who, in over 40,000 autopsies at the "Allgemeine Krankenhaus of Vienna," found only two cases of primary carcinoma of the appendix.

On the other hand, it would be of more than passing interest to know the relative frequency as compared with other diseases of the appendix. To solve this question, we can make but very little use of the few published cases, as they do not discuss this point at all. Nor can we learn any more by consulting the larger special treatises on appendicitis, in which this point appears to be discussed only in a very superficial manner.

Sonnenburg,¹⁵ who up to 1900 had operated upon about 750 cases of appendicitis, has evidently seen no case of primary carcinoma; in speaking of this subject, he merely refers to some cases in the literature.

Deaver¹⁶ says that in 706 cases of appendicitis operated during 1897, 1898, and 1899 there were found three cases of carcinoma of the appendix. (One of these is evidently a secondary tumor.)

Of late years, at Mount Sinai Hospital, between 200 and 300 cases of appendicitis are operated upon annually, and the three cases above described are the only ones which have been discovered up to the present time. It is to be regretted, however, that even these figures will allow of no definite deductions; the principal cause for this lies in our limited laboratory facilities, which do not permit the microscopical examination of the large number of appendices removed; only the extraordinary or suspicious cases are examined, and, as we have seen, this is by no means sufficiently accurate to permit an absolute opinion.

Primary carcinoma of the appendix may be studied from two different aspects: First, the clinical, and, second, the pathological.

I. THE CLINICAL ASPECT.

At the outset, it is necessary to state that, in the consideration of this side of the question, we are compelled to exclude all those cases which are the result of an accidental autopsy finding. If this is done, it will be seen that, for the purpose of making a clinical picture, there is available only the relatively small number of fourteen cases, viz., Jessup, one case; Kelly, two cases; Hurdon, one case; Rolleston, one case; Goffe, one case; Stimson, one case; Harte and Willson, two cases; Letulle and Weinberg, one case; McBurney, one case, and Moschcowitz, three cases.

Thus, while fourteen cases are hardly sufficient on which to build a definite clinical picture, even this number will be materially reduced by the fact that a number of these cases have been reported merely as medical curiosities, and therefore with incomplete clinical reports.

In attempting to make a clinical picture for the malady in question, I have been guided principally by the more common symptoms of appendicitis, viz., (1) Pain; (2) Tenderness; (3) The presence or absence of a mass; (4) Rigidity; (5) The temperature; (6) The pulse; (7) The presence or absence of adhesions; (8) The history of previous attacks; and, in addition, I shall discuss certain other anamnestic data which are presumably characteristic for carcinoma in other parts of

the body, viz., (9) The age of the patient; (10) The sex of the patient, and (11) The question of heredity.

(1) *Pain*.—Pain in the region of the appendix is noted in eleven of the fourteen cases, or in 78.5 per cent., viz., in Kelly's case "b," in Hurdon's case, in Goffe's case, in Stimson's case, in both Harte and Willson's cases, in Letulle and Weinberg's case "a," in McBurney's case, and in Moschcowitz's three cases. There was nothing characteristic about the pain in any one of the cases; in Hurdon's case the pain was not even suspected to be due to the appendix, but was ascribed to a concomitant floating kidney.

(2) *Tenderness*.—Tenderness in the region of the appendix was noted in ten of the fourteen cases, or in 71.4 per cent., viz., in Kelly's case "b," in Goffe's case, in Stimson's case, in both Harte and Willson's cases, in Letulle and Weinberg's case "a," in McBurney's case, and in Moschcowitz's three cases. Many of the reported cases are silent on this point; but pain and tenderness go so frequently hand in hand in all forms of appendicitis that it is safe to assume that tenderness was present in all of those cases in which pain was a symptom.

(3) *The Presence or Absence of a Mass*.—I do not refer at this point to the size of the tumor as found at the pathological examination, but only to the presence or absence of a mass to be felt by palpation through the abdominal walls. In none of the cases was the tumor palpable as such.

Prior to operation the presence of a mass was noted in only four cases, or in 28.5 per cent., viz., in Kelly's case "b," in Harte and Willson's case "b," in Letulle and Weinberg's case "a," and in Moschcowitz's case "a." In Kelly's case there was to be palpated a mass three inches in diameter; in Harte and Willson's case also a considerable mass was to be palpated; while in Moschcowitz's case a small mass was noted; in all three of these cases the mass was due to a concomitant peri-appendicular abscess. It may be worth while to note here that in Harte and Willson's case "a" we find reported no distinct mass, but what appeared to be a thickened appendix could be palpated.

(4) *Rigidity*.—Rigidity was noted in four of the fourteen cases, or in 28.5 per cent., viz., in Kelly's case "b," in both Harte and Willson's cases, and in Moschcowitz's case "a." In the greatest majority of the cases reported, this symptom is not commented upon; and it is also noticeable that, as was to be expected, the rigidity was noted only in those cases which were accompanied by the more acute inflammatory lesions, as abscess or gangrene.

(5) *The Temperature*.—Very few, if any, deductions are to be made from the data regarding this symptom, as, with the exception of our three cases, the temperature is noted only in two others. One of these, Kelly's case "b," was accompanied by an abscess, and had a temperature of 103.2° F.; while in the second case, Harte and Willson's case "a," the acute inflammatory signs were so little marked that a practically normal temperature prevailed throughout the entire course.

In one of our cases, case "c," very high temperatures were noted both before and even for some time after the extirpation of the appendix. However, we are convinced that this remarkable temperature curve was not in the slightest degree due to the condition of the appendix. While the absolute proof is still lacking, our impression was that the temperature in this case was due to some form of autointoxication having its origin in the gravid uterus. This impression is confirmed by the fall of temperature after the evacuation of the uterine contents, in spite of the fact that even a most careful examination of the foetus, placenta, and membranes failed to reveal anything pathological.

(6) *The Pulse*.—The annotations regarding this point are so meagre in the various reports that absolutely no reliable deductions are to be made. As a matter of fact, we do not see that in the malady under discussion (unless very far advanced) the pulse-rate could be of any importance; any increase in the pulse-rate would be rather due to the accompanying inflammatory phenomena. In one of our cases, case "c," it is true there was a marked increase in the pulse-rate, but

this, as already stated under "temperature," was due probably entirely to extrinsic causes.

(7) *The Presence or Absence of Adhesions.*—The presence of adhesions was noted in seven of the fourteen cases, or in 50 per cent., viz., in Jessup's case, in Kelly's case "b," in Hurdon's case, in Rolleston's case, in Harte and Willson's case "b," in Letulle and Weinberg's case "a," and in Moschcowitz's case "a." Their absence was noted in four of the fourteen cases, or in 28.5 per cent., viz., in Harte and Willson's case "a," in McBurney's case, and in Moschcowitz's cases "b" and "c;" it was not noted in the others. To the writer, the question of the presence or absence of adhesions appears to be of considerable importance. It may be safely assumed that a growing carcinoma in the intestinal tract will sooner or later form adhesions to the surrounding viscera, particularly after the growth has invaded the serosa. However, after a careful study of the recorded cases, one naturally comes to the conclusion that in none of the cases was the involvement of the serosa so extensive that any existing adhesions could be definitely attributed to the actual presence of the new growth; on the contrary, it is our opinion that they were most probably due to the accompanying inflammatory process.

(8) *History of Previous Attacks.*—This, again, is a question of considerable importance in the study of the subject; however, not so much from the stand-point of symptomatology, but rather from that of prognosis. If it can be proven with a positive degree of certainty that all cases of carcinoma of the appendix have been preceded by undoubted attacks of appendicitis, or, better said, if it could be proven that a carcinoma, even if not always, but only sometimes, develops in appendices which have been the seat of a preceding acute or chronic inflammatory process, it would form another plea in favor of the radical procedure of extirpating every appendix which has been the seat of such an inflammatory process. But very little has been done in the study of this question; and it is decidedly to the credit of Letulle and Weinberg⁵ to have proven with some satisfaction the development of a carcinoma in two cases

of so-called "obliterating" appendicitis. In these two cases the carcinoma developed at the site of a stenosis, which in turn was caused by cicatrization of an ulcer in the mucosa. Harte and Willson also give expression to this view in their publication.

On looking over the various histories, we find a history of previous attacks in eight of the fourteen cases, or in 57.1 per cent., divided as follows as regards the number of the attacks and the duration of pain in the right iliac fossa. Rolleston's case had four attacks; Goffe's case had pain in the right iliac fossa for one year; Stimson's case had three attacks; in Harte and Willson's case "a" there were at least two attacks, and possibly more; in case "b" there were previous attacks (number not stated), and patient complained for a long time of almost continuous pain in the appendicular region; Letulle and Weinberg's case "a" had at least three attacks; McBurney's case had at least two attacks; Moschcowitz's case "a" complained for several months of pains in the right half of the abdomen.

There is no history of previous attacks of appendicitis in four cases, viz., in Kelly's case "b," in Hurdon's case, and in Moschcowitz's cases "b" and "c." The question is not discussed in the other reports. Of the twelve cases, therefore, in which this point is mentioned, we find a distinct history of previous attacks of appendicitis in eight cases; in other words, this means that in 66.6 per cent. the carcinoma was preceded by acute inflammatory symptoms. I concede very readily that the reverse might also be argued, namely, that the carcinoma was of older standing, and that all the symptoms were due only to its presence. This is not by any means impossible, when one considers that the growth, impinging upon the lumen of the appendix, must cause a stenosis; and it is well known that appendices which are stenosed from any cause give definite symptoms of appendicitis. While this may be brought as an argument by the over-cautious, it is more than probable that the obverse is the truth. Attention is called here again to the very able and convincing work of Letulle and Wein-

berg (*loc. cit.*). Abundant analogies might also be adduced from carcinomata in other regions of the body, where we not infrequently find these developing in cicatrices or on the basis of preceding ulcerations; it is an undisputed fact in pathology that malignant growths not infrequently develop as a result of long-continued irritation; attention is called here only to the scrotal carcinoma of chimney-sweeps and to the labial carcinoma of pipe-smokers, etc.

The preceding eight symptoms referred particularly to the localization of the tumor in the appendix; the following three symptoms bear more particularly upon the question of the presence of the malignant tumor.

(9) *The Age of the Patient*.—The study of this question has at all times received considerable attention in the making up of statistical reports on carcinoma; and, as a result of this study, the conclusion has been arrived at, that carcinoma, while by no means impossible, is at least seldom met with below the age of forty. Applying the question of age in carcinomata of the appendix, we find the following:

Letulle and Weinberg's case was twelve and one-half years old.

Goffe's case was fifteen years old.

Kelly's case "b" was nineteen years old.

Moschcowitz's case "b" was twenty years old.

McBurney's case was twenty-three years old.

Hurdon's case was twenty-four years old.

Harte and Willson's case "a" was twenty-four years old.

Moschcowitz's case "c" was twenty-four years old.

Harte and Willson's case "b" was twenty-five years old.

Rolleston's case was twenty-six years old.

Lartigau's case was thirty years old.

Jessup's case was thirty-six years old.

Moschcowitz's case "a" was thirty-seven years old.

Stimson's case was forty-four years old.

Whipham's case was forty-five years old.

Mosse and Daunic's case was fifty years old.

In five of the available twenty-one cases the age of the patient is not given. Leaving these five out of consideration, and utilizing for our analysis only the sixteen cases in which exact data are given, even at the first casual glance, one fact stands out in particular prominence, namely, the unusual early age in which carcinoma of the appendix predominates. In eleven of the sixteen cases, or in 68.7 per cent., the patients were at or below thirty; and in five only, or in 31.2 per cent., were they above that age.

It is customary, for the sake of more ready supervision, to tabulate material of this nature by decades; if this is done, we would find the following figures:

The first decade with no cases.

The second decade with four cases.

The third decade with seven cases.

The fourth decade with two cases.

The fifth decade with three cases.

What is the reason for this striking difference in carcinoma of the appendix when compared with carcinomata in other parts of the body? It has already been mentioned that carcinomata of the appendix not infrequently develop on the basis of old inflammatory processes; it is also conceded, and it has also been our experience at the Mount Sinai Hospital and in private practice, that in the greatest majority of instances appendicitis occurs in the second and third decades of life; the natural conclusion must be that carcinoma develops in appendices most frequently at that time of life in which the acute inflammatory processes in the appendix are most common.

In corroboration of this point, it is interesting to note that in none of the cases reported do we find an appendix which is the seat only of the new growth, but it is always accompanied by additional inflammatory changes. As this is, however, more in the realm of a pathological question, this will be discussed more in detail in that part of this work.

(10) *Sex*.—The sex of the patient is noted in sixteen of the twenty-one cases of my report. Of these twelve, or 75 per

cent., were females. I give these figures for what they are worth, without attempting any deductions. I do not know that there are any definite reasons which would predispose the female sex to the development of carcinoma in the appendix. With the exception of the occasionally present appendiculo-ovarian ligament, the anatomy is identical in all respects in both sexes. At all events, this great preponderance in the female sex is, to say the least, singular.

(11) *Heredity*.—Custom, perhaps, more than sound scientific principle, has devoted some importance to the question of heredity in cancerous disease. An examination of our cases regarding this point has revealed the following facts. In two cases we find a fairly distinct hereditary history. In Hurdon's case, a brother of the patient had a leg amputated for a "cancer;" and in Goffe's case, a grandmother of the patient had a cancer of the uterus, and an aunt a cancer of the breast. In the remainder there was either no history of heredity or there are no remarks regarding this point.

II. THE PATHOLOGICAL ANATOMY.

Under this heading we have to consider the following points: (1) The length of the appendix; (2) The size of the tumor; (3) The variety of the tumor; (4) The location of the tumor in the appendix; (5) The relation of the tumor to the walls of the appendix; (6) Accessory pathological findings. It is hardly necessary to remark that other questions, partly of a clinical nature, bear an important relation to the pathological anatomy, but, as these have already been considered in the clinical part, they will not again be repeated at this place.

(1) *The Length of the Appendix*.—The length of the appendix was noted in twelve cases, viz., the appendix was four centimetres long in Mosse and Daunic's and Letulle and Weinberg's case "a;" five centimetres in Kelly's case "b;" six centimetres in Jessup's case; seven centimetres in Moschcowitz's cases "b" and "c;" 7.5 centimetres in Moschcowitz's case "a;" ten centimetres in Hurdon's case; eleven centi-

metres in Kelly's case, "a;" four inches in Stimson's and McBurney's cases; and fifteen centimetres in Harte and Willson's case "a." In Goffe's case the appendix is stated to be unusually long; in the remainder the length of the appendix is not given. In other words, appendices of all lengths have been found to be the seat of carcinoma; there is evidently no particular rule; if anything, it appears that in the majority of instances the appendices were longer than the average. At all events, it cannot be said that anything of value could be argued from this finding.

(2) *The Size of the Tumor.*—This point is of far greater importance than the one just spoken of. It is very much to be regretted that regarding this point some of the histories are absolutely silent. I have been able to find data only in fourteen of the reported twenty-one cases, viz., in two cases, Harte and Willson's cases "a" and "b," the tumor was only microscopical, *i.e.*, no tumor at all was to be seen on macroscopical examination; in Kelly's case "b" the tumor was also very small, *i.e.*, a cross section of the tumor occupied hardly three-fourths of the microscopical field when viewed with an A. A. Zeiss objective and a number two eye-piece; in Goffe's case the tumor was five millimetres in diameter; in Kelly's case "a" the tumor was six millimetres in diameter; in Letulle and Weinberg's case "c" the tumor was 1520 microns long and 143 microns wide; in McBurney's case the tumor was the size of a pea; in Letulle and Weinberg's case "b" the tumor was of the size of a cherry-pit; in Hurdon's case the tumor was one centimetre long and 0.5 centimetre thick; in Moschcowitz's case "a" the tumor was nine millimetres long and seven millimetres wide; in Moschcowitz's case "b" the tumor was 1.3 centimetres long and seven millimetres wide; in Moschcowitz's case "c" the tumor was 1.2 centimetres long and seven millimetres wide; and, finally, in Rolleston's case the tumor was the size of a marble. In Letulle and Weinberg's case "d" the size of the tumor could not be ascertained, on account of disintegration of the tissues; in the remaining eight cases the size of the tumor is not stated. In other words, it is seen that

the tumor varied very much in size; it varied from a microscopic size to that of a marble.

Of course, it would be an enormous advance in the diagnosis of carcinoma of the appendix if we could palpate the tumor; and it is by no means excluded that, everything being favorable, a tumor of the size of a marble, could possibly be palpated; but as was seen from the reported cases, a tumor of this size was present in only one instance; a majority of the tumors was very small, some only microscopic in size; it is seen therefore that this symptom, which would be the only sure sign of a carcinoma of the appendix, is almost beyond our possibility.

While there appears to be no doubt of the pathological diagnosis in any of the cases published, it is perhaps permissible to again call attention to the fact that a certain amount of care is to be paid in making the diagnosis of a carcinoma, particularly in those cases in which no tumor is to be seen macroscopically. Two of the cases in my list (Harte and Willson's cases "a" and "b") were, as already stated, so small that the carcinoma was discovered only in the routine microscopical examination. Judging merely from the description of the microscopical picture, and from the illustration attached (which, it is to be regretted, are merely reproductions of a very low power), there does not appear to be any doubt of the correctness of the diagnosis. Even without any reference to the cases in my list, it may not be amiss to sound a warning in making the diagnosis of a carcinoma in those cases in which no actual tumor formation is found; this warning applies particularly to tumors of the intestinal tract. It is only since studying this question that my attention has been called to the work of Askanazy,¹⁷ wherein he calls attention to the inflammation of the lymphatic vessels which accompany the sympathetic nerves, in inflammatory diseases of the peritoneum and intestines. We find in these cases the perineural lymph spaces more or less filled with cells, forming a picture not unlike that of a carcinoma alveolus; in a space where many of these lymphatics happen to be grouped together, the resulting

picture may very readily resemble such a tumor. As a matter of fact, Askanazy states that such findings have not infrequently been mistaken for carcinoma, viz., "Mir ist es sogar begegnet, dass ein nicht ungeübter Mikroskopiker mir die hier besprochenen Gebilde als mit Krebszellen injicirte Lymphgefäße vorlegte."

(3) *The Variety of the Carcinoma.*—Many endeavors have been made by me to arrive at some uniformity regarding the question of the variety of the carcinoma, but all attempts have been futile. The cases are so varied and manifold in their description that if all the characteristics are to be taken into account, practically each and every case would have to be described as an entity by itself, and but very little would be gained by such a procedure. As a general thing, it might be stated that most of the cases correspond to that type known as "adenocarcinoma;" some of the cases, again, respond more to the description of "alveolar carcinoma;" and, finally, others show combinations of these two. Neither will a description of the proliferating cells throw much light upon the subject, as even, in this respect, there does not exist any unanimity in the cases which devote some space to this discussion. We find, for instance, the following cells described as polyhedral cells, low columnar cells, oval cells, polymorphous cells, epithelioid cells, etc.

Our three cases are described by Dr. F. S. Mandlebaum, pathologist to the hospital, in the following manner:

CASE I.—I. S. The appendix is 7.5 centimetres long. Near the tip of the organ, and extending to within four millimetres of the tip, there is a well-defined tumor, nine millimetres long and seven millimetres wide, springing from the mucosa, and not seeming to infiltrate the muscular coats of the organ.

Microscopical examination of the tumor. At the site of the tumor, the normal lymphoid tissue as well as the mucosa are absent. The tumor itself presents in parts a general adenomatous appearance, and a lumen is seen in most of the cell clusters. In some places the epithelial cells become more atypical, and show a tendency to proliferate into the surrounding tissue. A firm

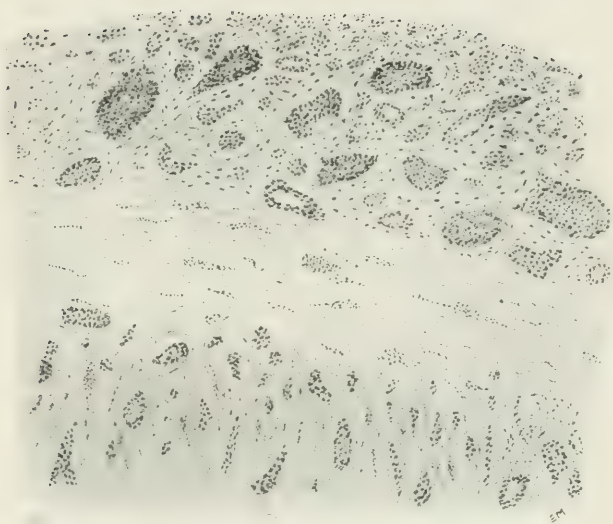


FIG. 4.—Adenocarcinoma of the appendix vermiciformis.

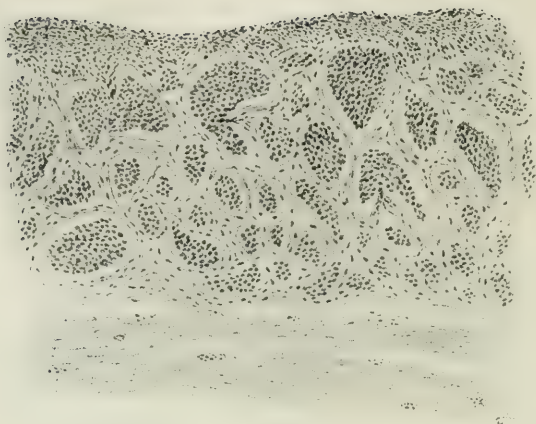


FIG. 5.—Medullary carcinoma of appendix vermiformis.



FIG. 6.—Medullary carcinoma of appendix vermiformis.

connective-tissue stroma is present between the various islands of epithelial cells. Considerable acute inflammation is noted, as evidenced by a large number of leucocytes and a moderate amount of small lymphocytes. The circular coat of muscle-fibres is not involved by the tumor, but presents the usual characteristic appearance of an acute inflammation, made apparent by a large collection of leucocytes running parallel to the muscle-fibres. The longitudinal layer of muscle-fibres, on the other hand, shows much involvement by tumor cells. The epithelial cells in this situation show the same general arrangement as in the tumor proper. The peritoneal surface is the seat of an acute purulent inflammation. No mitosis is apparent in the tumor. Auerbach's plexus appears quite normal. The mucosa at the edge of the tumor shows ulceration and acute purulent inflammation.

Diagnosis.—Adenocarcinoma of the appendix, with infiltration of deep muscularis; acute purulent inflammation (Fig. 4).

CASE II.—R. P. The appendix measures seven centimetres in length. A well-defined tumor is present 1.6 centimetres from the tip of the organ; the tumor is situated in the mucosa, and is 1.3 centimetres long, and seven millimetres wide.

Microscopical examination shows the following: The tumor springs from the mucosa, and does not infiltrate the muscularis, though at one place a slight extension into the submucosa has occurred. A well-marked capsule separates the growth from the surrounding tissues. No mucosa is left at the site of the tumor. The tumor proper consists of epithelial cells, arranged in nests, showing no tendency to the formation of any lumen; these nests are of various size and shape, and are all surrounded by fibrous connective tissue. A few leucocytes are scattered throughout the connective-tissue stroma. In one or two situations small collections of lymphoid cells are noted. The tumor is very rich in cells, and the stroma is somewhat scanty. No evidences of active cell division are seen. No changes are noted in the appearance of Auerbach's plexus.

Diagnosis.—Medullary carcinoma (Carcinoma simplex) of the appendix; moderate acute inflammation (Fig. 5).

CASE III.—M. G. The appendix is seven centimetres long. At the extreme tip of the organ there is a tumor, 1.2 centimetres long and seven millimetres wide. This portion of the appendix is distinctly enlarged by the presence of the growth, but not

until the appendix is cut open does the tumor proper appear visible. It is distinctly confined to the mucosa.

Microscopical examination. The growth is a typical medullary carcinoma, though at its free margin it somewhat resembles an adenocarcinoma in appearance. The connective-tissue stroma is only moderate in amount. Small groups of tumor cells are seen infiltrating both muscular coats of the organ. No mitosis is seen. Chronic inflammatory changes are present, principally on the surface of the tumor. Auerbach's plexus appears normal.

Diagnosis.—Medullary carcinoma of the appendix; chronic inflammation (Fig. 6).

(4) *The Location of the Tumor in the Appendix.*—The location of the tumor in the appendix is indicated in nineteen of the histories. The tumor was situated at or near the tip of the organ in nine cases, viz., in Goffe's case, in Letulle and Weinberg's cases "b," "c," and "d," in McBurney's case, in Lartigau's case, in Rolleston's case, and in Moschcowitz's cases "a" and "c;" in or near the proximal third in three cases, viz., in Kelly's case "b," in Wright's case, and in Whipham's case; between these two points in seven cases, viz., in Jessup's case, in Kelly's case "a," in Hurdon's case, in Harte and Willson's cases "a" and "b," in Letulle and Weinberg's case "a," and in Moschcowitz's case "b." The only matter of note in these findings is that only in a small minority, three cases, or in 15.7 per cent., was the tumor located at or near the cæcal end of the appendix; and it is not impossible that in a certain number of carcinomata of the cæcum the primary beginning of the growth may have been in the appendix and not in the cæcum. Attention to this point has already been called by a case operated upon at Thiersch's clinic, and reported by Beger,¹⁸ and by a case reported by Regling.²¹

(5) *The Relation of the Tumor to the Walls of the Appendix.*—Of more importance is the relationship which the tumor bears to the various coats of the appendix, particularly as to whether the carcinoma is primary in the appendix or only secondary to a carcinoma in another part of the body, more especially in some other intra-abdominal viscus. On look-

ing our list over, we find this relationship noted in fifteen of the twenty-one cases; and for the first time do we find a unanimity. This unanimity is so absolute that it is sufficient cause for the assumption that the rule holds good for all cases. In all these cases, from the largest to the smallest, no matter in what portion of the appendix the tumor was found, nor of what variety the carcinoma, the tumor was always situated in the mucosa, and, beginning in the mucosa, it infiltrates the other coats of the appendix. Corroborative of this point is the fact that the larger the tumor the deeper did this infiltration extend; in some of the larger cases even into the serosa.

Carcinomata of the appendix, therefore (as is to be expected), follows the general plan of primary carcinomata in other portions of the intestinal tract, namely, that they have their origin usually in the mucosa. This rule is so constant, that when one finds a tumor in the serosa of the appendix, in the course of an operation, it may be safely regarded as secondary rather than as a primary growth.

In this connection it is perhaps only just to again call attention to the correctness of the diagnosis in the case of Whipham (*loc. cit.*), which has rather frequently been doubted by subsequent writers. In Whipham's case there was found, in addition to the tumor in the appendix, also a carcinoma of the ovary as well as metastases in the liver and peritoneum. Upon this finding, and on account of the more frequent occurrence of carcinoma in the ovary, some subsequent writers have doubted the diagnosis of primary carcinoma of the appendix, and claimed the case to be a primary carcinoma of the ovary. On examining Whipham's article, however, we find it distinctly stated that the carcinoma was situated in the mucosa and submucosa, and from this point on it also infiltrated the muscularis. I believe, therefore, that Whipham has judged his case correctly, and that his case belongs justly in the list of primary carcinomata of the appendix.

(6) *Accessory Pathological Findings*.—Six of the cases make no statements regarding this point; in one case, Hurdon's, we find that the appendix was not markedly diseased;

in the remainder the appendix was distinctly diseased, varying from a simple catarrhal inflammation in the mildest to complete gangrene, with perforation, in the severest cases. In this connection, again, the question arises as to which was the primary and which the secondary lesion? Was the carcinoma primary, and was its simple presence sufficient to excite an inflammatory process? Or was the inflammation the primary lesion, and did the carcinoma develop upon it as a basis? It cannot be denied that there exists still a third possibility, namely, that both are absolutely independent lesions, and that they have nothing to do with each other. However, from a study of the cases, the writer has gained the impression that the weight of evidence is most emphatically in favor of assuming that the inflammatory process was primary, and that the carcinoma developed secondarily, upon the basis of the inflammation. This assumption is based upon the following factors:

(1) That no case (I except Hurdon's case, in which the statement is made that the appendix was not markedly diseased) has been reported in which no other lesion, excepting the carcinoma, was found.

(2) That practically all the cases reported (again I except Hurdon's case) were associated with some degree of inflammation.

(3) That in many of these cases we find mention of stenoses and of complete obliterations of the lumen of the appendix; lesions which must have existed a considerable time before the onset of the carcinoma.

(4) That the greatest majority of the cases give a history of one or more antecedent attacks of appendicitis.

(5) That the carcinoma in all cases begins in the mucosa, that is, in that coat of the appendix in which the inflammatory lesions are most marked.

(6) The accurate and painstaking deductions of Letulle and Weinberg (*loc. cit.*), which prove with certain conclusiveness that in their cases the carcinoma developed on top of an obliterating appendicitis. Letulle and Weinberg give the following *résumé* of their work: "A la suite d'une appendicite

ulcèreuse aiguë, et vraisemblablement nécrosante, terminée par symphyse de la couche sous-muqueuse (obstruction totale), une partie circonscrite (peut-être le cul-de-sac d'une glande de Lieberkühn non détruite) a été enclavée dans la cicatrice et est devenue, secondairement, l'origine d'une évolution cancéreuse. Ce cancer, ainsi développé au contact d'un tissu de cicatrice, a pu s'infiltrer successivement à travers les couches musculuses et sous-séreuses, sous-jacentes. Plus tard, l'infection carcinomateuse a fusé, par les voies lymphatiques sous-séreuses et remonté plus ou moins haut, le long des parties non obstruées de l'appendice; en même temps, les colonies carcinomateuses descendent vers l'extrémité libre." . . . "As a result of an acute ulcerative and probably gangrenous appendicitis, terminating by a union of the submucous coat (total obstruction), a circumscribed portion (possibly the cul de sac of an undestroyed gland of Lieberkühn) has been enclosed within the cicatrix, and has secondarily become the origin of a cancerous evolution. The cancer thus developed by contact from a cicatricial tissue has been able to infiltrate successively the various subjacent muscular and submucous coats. Later the carcinomatous infection has spread by the way of the subserous lymphatics, and has risen more or less into the unobstructed portions of the appendix; at the same time the carcinomatous columns descend towards the free extremity."

It is not my province to enter at this place into a detailed discussion of the genesis of carcinoma, but because the findings and theories of Ribbert¹⁹ are so eminently corroborative of the hypothesis set forth above, it is perhaps permissible to allude to this question. Ribbert claims that carcinomata are merely overgrowths of normal epithelium which has been detached from its normal site. This detachment, he claims, is the result of a previous inflammatory process, whereby the proliferating connective tissue penetrates between the epithelial cells, and ultimately encloses them in a sheath of their own. The epithelial cells, having been separated in this way from their normal habitat, proliferate in an abnormal manner and produce the lesions of carcinoma. In other words, Ribbert

assumes a primary inflammation in all cases of carcinoma, and our findings in carcinomata of the appendix substantially corroborate this view.

Résumé.—I have gone at some length into the discussion of the various signs, symptoms, and anamnestic data regarding the question of the primary carcinomata of the appendix; perhaps longer than the subject would warrant. In spite of this, it does not appear to me that, with our present knowledge, we have reached a stage where we can recognize the disease prior to operation, or, for that matter, even after operation, before the microscopical examination. We have, however, obtained the following data from our study:

(1) No exact figures can be given regarding the frequency of primary carcinoma of the appendix. It is certainly very rare, when compared with the enormous frequency with which the inflammatory diseases of the appendix occur. It is, however, not impossible that in time we shall have to modify our opinion regarding this point, as it appears that more and more cases are being reported, particularly in the last few years.

(2) It appears that all "primary" carcinomata of the appendix begin in the mucosa.

(3) It seems more than probable that all primary carcinomata of the appendix take their origin in some preceding inflammatory process.

(4) Primary carcinoma of the appendix is most frequent at that time of life in which the inflammatory diseases of the appendix are most frequent; and this accounts for the early age of most of the patients reported.

(5) Primary carcinoma of the appendix is more frequent in the female sex than in the male; the cases reported admit the ratio of three to one.

(6) If it shall prove true that primary carcinomata of the appendix originate in the inflammatory processes, it forms an additional argument for the removal of the appendix, once diseased.

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- ²¹ Regling. Deutsche Zeitschrift für Chirurgie, vol. lxxv, page 376.

EXCISION OF THE SCAPULA FOR PROGRESSIVE CHRONIC INTERSTITIAL MYOSITIS ASSO- CIATED WITH OBLITERATING ENDARTERITIS.

BY WILLIAM B. HOPKINS, M.D.,

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Surgeon to the Pennsylvania Hospital.

THE history of this very rare case may be summarized as follows: E. D., aged eight years, colored, was admitted to the Pennsylvania Hospital, December 9, 1901. He had fallen upon his left shoulder two months before. An abscess followed the contusion and pointed near the summit of the shoulder. After healing, it reopened in a few days, and there remained a sinus, which continued to discharge freely, and communicated with what appeared to be carious scapula. A month later a mass of almost bony hardness began to develop over the body of the scapula, and a skiagraph taken at that time clearly indicated that the mass was in part, at least, composed of bone. Four months later the mass having continued to grow into a dome-shaped tumor, which corresponded in outline to the body of the scapula, the child was etherized and the scapula excised. Preparatory to the excision, an exploratory incision was made half an inch to the upper side of the inner border of the scapula. A fragment of the mass was removed, and a hasty examination of a frozen section led to the conclusion that the growth was a sarcoma. The operation was proceeded with after the method of Ollier, all of the tissues overlying the bone, except the integument, being removed with the latter. The only detail of the procedure that may be mentioned was the easy arrest of hæmorrhage obtained by getting perfect control of the bone with heavy lion-jawed forceps. In this way, after the superficial attachments had been divided, it was possible to elevate the bone and clearly expose vessels as they were divided.

The child made an uneventful recovery, there being moderate suppurative for a short time, when the wound closed permanently. An examination of the growth subsequently made proved that it



FIG. 1.—Excised scapula.

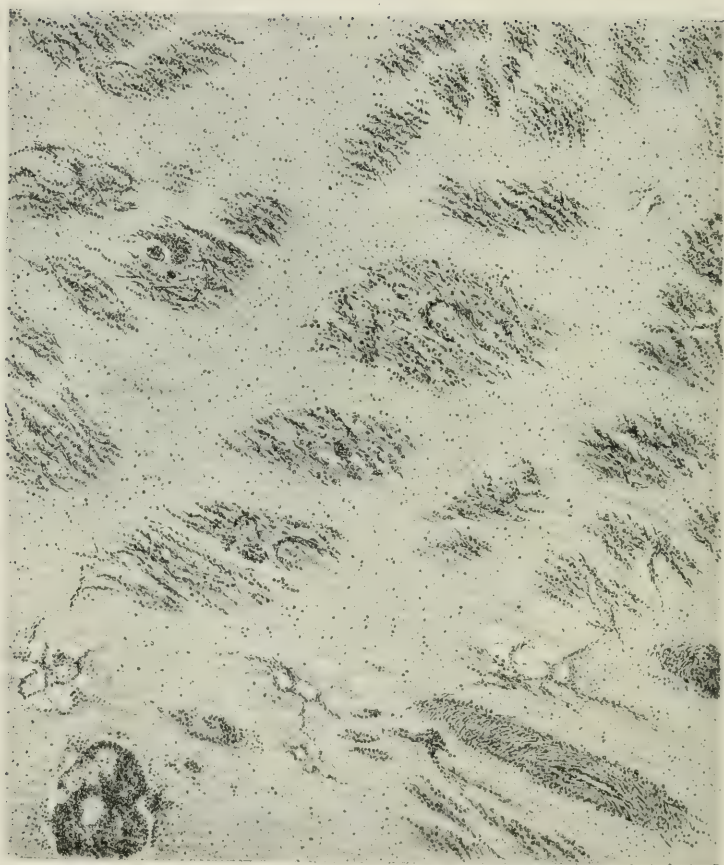


FIG. 2.—Chronic interstitial myositis.

was not one of a sarcoma, but of progressive chronic interstitial myositis associated with obliterating endarteritis.

Sections through the muscles attached to the scapula show the following condition reported from the Ayer Laboratory:

The muscle-fibres in some sections are separated by a large amount of fat. Between the fat, the muscle-cells lie either in single narrow bundles with proliferation of nuclei and irregular ill-defined striations, or in small masses composed of several such muscle-bundles. In other sections areas of muscles have undergone complete degeneration, only here and there the nucleus retaining the strain. Between these areas the muscle-bundles are seen, some of them partially degenerated, others small, without striations and showing proliferation of the nuclei. Many of the fibres are broken and curled. In cross-section they bear a close resemblance to epithelioid cells with ingested nuclei. These areas of degenerating muscle are infiltrated with small and round cells, epithelioid cells, and a few polymorphonuclear leucocytes. About the cells are masses of small round cells with deeply staining nuclei. Capillaries are numerous in all these areas. In other sections the complete degeneration of the muscle is not so extensive, and here the masses of partially degenerating muscle comprise the greater portion of the section.

In all the vessels a very marked endarteritis is present, which becomes obliterative in the smaller vessels and almost closes the larger ones.

A functional recovery of the upper extremity eight months after the operation was remarkable. The child could push and pull with the arm with considerable force. His general condition was satisfactory, and there was no sign of recurrence of the disease. In connection with this case, it may be interesting to review the following list of similar operations, the very large proportion of which have been done for sarcoma.

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INSTRUMENTS FOR USE THROUGH CYLINDRICAL RECTAL SPECULA, WITH THE PATIENT IN THE KNEE-CHEST POSTURE.

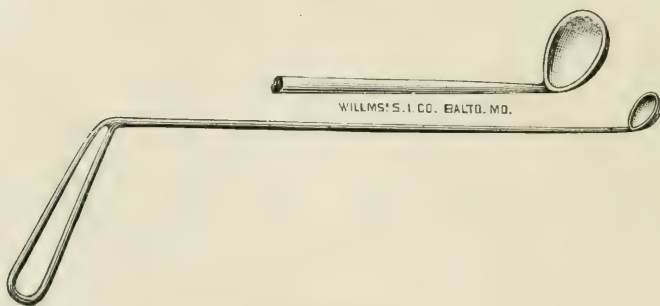
BY HOWARD A. KELLY, M.D.,

OF BALTIMORE,

Professor of Gynæcology in the Johns Hopkins University.

FOR examining the rectum in its different portions from the anal orifice up into the sigmoid flexure, I have had a great variety of specula made, from the very shortest, not much over an inch in length, to the longest, about thirty centimetres; the diameter of these specula varies from about four centimetres down to one and one-half and one centimetre. The smallest sizes are necessary in examining through strictured

FIG. 1.



Rectal scoop.

areas. I have thus had upward of forty specula made altogether, many of them being devised simply to fit particular cases.

My method of examining and treating the rectum under air inflation, naturally induced in the knee-chest posture by elevation of the pelvis, has also brought with it the necessity for certain auxiliary instruments for removing pieces of tissue, for swabbing, for treatments, etc.

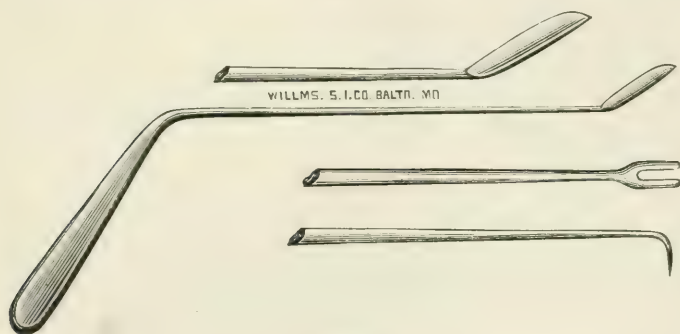
Some of the instruments I have gradually accumulated

for these purposes are the following: a scoop, a packer, a powder insufflator, alligator forceps, tenacula, tenaculum forceps, scissors, and knives.

These instruments all necessarily have two features in common,—a handle, about eight or ten centimetres in length, bent downward at an angle of 45 degrees from the instrument proper, and a shank long enough to be used through the longer specula, that is to say, from fifteen to twenty-five centimetres in length.

The rectal scoop (Fig. 1). The scoop is a little spoon on the end of one of these long handles, bent at an angle of about 70 degrees to the shank of the instrument, in a direction opposite to that of the handle, used to clear the bowel or the lumen of the speculum of any faecal masses which enter it.

FIG. 2.

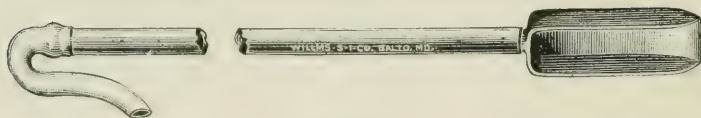


Packer.

The packer (Fig. 2). The packer is simply a blunt fork like my vaginal packing instrument, used for carrying cotton or long strips of gauze through the speculum and packing it into the bowel, so as to make a prolonged application to a diseased area. Sometimes I tampon or fill up the rectum for several inches in this way, leaving a string hanging outside of the bowel by which the tampon can be withdrawn. At other times I leave the tampon *in situ* without any string, expecting the foreign body to be passed when the bowel is moved naturally. Cotton tampons often pass without the patient being aware that the evacuation is other than a normal one.

Powder shovel (Fig. 3). The powder shovel is used with an insufflator to convey powder up into the bowel beyond the end of the speculum. The powder is then diffused over the

FIG. 3.

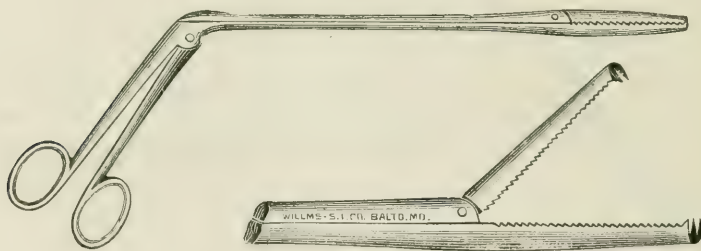


Powder shovel.

diseased surface by insufflation, through compressing a rubber ball attached at the end of the tube.

Alligator forceps (Fig. 4). The alligator forceps resembles those used by throat specialists, only they are larger, the jaws being two and one-half centimetres in length and four millimetres in width. These are provided with teeth at the end to hold the tissue grasped.

FIG. 4.



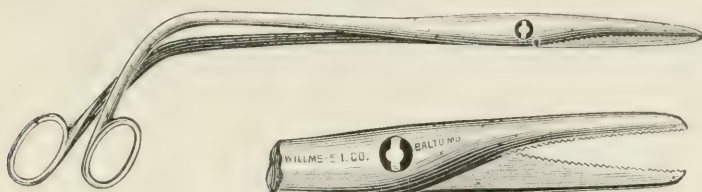
Alligator forceps.

Tenaculum. The tenaculum is simply a uterine tenaculum about twice the ordinary length. It is valuable in transfixing and lifting up a bit of tissue to be removed by the scissors.

Scissors (Fig. 5). The scissors are made with a bent handle like the other instruments and with long shanks about twenty centimetres to the lock; they work in a vertical direction. In one pair of the scissors I have had the cutting surface made about three centimetres in length, with fine saw-teeth on each blade. These are invaluable in snipping off little pieces of suspected tissue for microscopic examination.

Tenaculum forceps (Fig. 6). The tenaculum forceps is made to work like the alligator forceps, and serves to pick up cotton or catch any other foreign body lodged high up in the rectum.

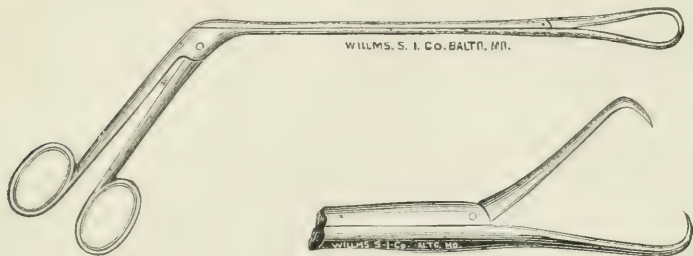
FIG. 5.



Saw-teeth scissors.

Knife. The knife is also made in the way common to all, with a delicate blade one and one-half centimetres long by three millimetres in width, turned upward at an angle of about 35 degrees.

FIG. 6.



Tenaculum forceps.

I have also devised a needle, on a long arm like the other instruments, with an eye in the end for the purpose of carrying a piece of silk through the pedicle of a polyp at any point in the bowel above the ampulla, with the expectation of catching the silk and drawing it out of the eye with the tenaculum after the transfixion. The needle should then be withdrawn and the ligature tied, making counterpressure at a point beyond the tumor with the fork of the packing instrument.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, February 11, 1903.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

PERFORATING ULCER OF THE STOMACH.

DR. JOHN F. ERDMANN presented a man, thirty-seven years old, a tailor by occupation, who was seen in consultation with Dr. D. H. Jones, on January 18, 1903, at three o'clock in the afternoon. The patient stated that on the previous day, just eighteen hours before his admission to the hospital, he had a sense of uneasiness in his abdomen following a light lunch, and was suddenly seized with a sharp attack of pain, constant, but with cramp-like exacerbations, extending from right to left above the umbilicus. At its onset the pain was most intense in the epigastrium; it became generalized after a few hours, but upon deep pressure the point of greatest pain was still in the region of the pit of the stomach. He also complained of marked tenderness in the region of the appendix. The right rectus was rigid at the usual segment, as seen in appendicitis, but, in addition, the upper segment was more rigid and resistant.

A diagnosis of perforation of the stomach or duodenum was made, and the abdomen was opened through the upper segment of the right rectus. Upon opening the peritoneal cavity, a bile-stained, cloudy fluid was extruded; this contained flakes of fibrin, but no food particles. The surrounding viscera were congested and covered with fibrin flakes. After sponging out five or six ounces of bile-stained fluid from Morrison's pouch and this region, the general peritoneal cavity was walled off with gauze pads and a search made for the duodenal portion of the stomach. On

the anterior wall of the stomach, near the lesser curvature, and half an inch from the pylorus, a perforation about the size of a crow's quill was found, through which gas and a yellow fluid were escaping. The opening was round and clean-cut, and surrounded by an area of infiltration about the size of a silver quarter. The opening was closed with three purse-string sutures, and, after sponging Morrison's pouch and the exposed area with peroxide of hydrogen and salt solution, the abdomen was closed, without drainage.

The patient made an uneventful recovery, with the exception of a subcutaneous hæmatoma which developed in the site of the incision, and later broke down and was drained. He was given nothing by the mouth until the eighth day, when small quantities of milk and peptonized broth were allowed, and during the past week he had taken solid food. A careful inquiry into his history preceding the onset of his attack of pain failed to elicit any symptoms of gastric disturbance.

PERFORATING ULCER OF THE STOMACH.

DR. JOSEPH A. BLAKE presented a man, forty-seven years of age, who was admitted to the Roosevelt Hospital on December 4, 1902, with the following history: The previous and family history was negative. For eleven years he had attacks of epigastric pain, sometimes accompanied by tenderness in the right iliac fossa. These attacks bore no relation to the ingestion of food, and lasted only from two to five hours. There had been no attacks in two years. There was an indefinite history of slight indigestion.

At 9 A.M. on the morning of admission, he experienced a sudden very severe pain in the epigastrium, accompanied by nausea but not by vomiting, and by extreme tenderness of the whole right side of the abdomen. The pain was so severe as to be unbearable. He was brought to the hospital at 11 A.M. still in severe pain. The abdomen at that time was scaphoid; there was marked general rigidity excepting the left lower quadrant. The liver-dulness was normal. The tenderness was most marked at the upper part of the right rectus and at the right iliac fossa. He was given eight minims of Magendie's solution.

The temperature was 100° F.; pulse, 78; respirations, 24. When seen by me six hours later there was no pain whatever. The abdomen was not distended, and percussion was normal;

there was only slight tenderness at the upper part of the right iliac fossa and at the upper part of the rectus abdominis. The rigidity had also disappeared, with the exception of a slight amount over the upper part of the right rectus. The temperature and pulse were the same as on admission. The leucocyte count was 16,000. This and the history of severe pain and rigidity decided him to operate.

The diagnosis was in doubt, but ulcer of the stomach was practically excluded on account of the subsidence of the symptoms, and from the fact that there had been no gastric history. An incision was first made over the appendix, and it was found bound down by old adhesions and surrounded by an abundant seropurulent exudate. It was removed before it could be demonstrated to be intact. The pus was coming from above, and the characteristic odor of stomach contents was noted. An incision was therefore made in the median line above the umbilicus and a perforated ulcer at the anterior surface of the pylorus found. The diameter of the perforation was seven millimetres, of the ulcer and its indurated margin, 3.5 centimetres. The stomach contents were flowing freely from it. As more than half of the pyloric ring was involved, an excision and pyloroplasty were done, the line of suture running at right angles to the axis of the gut. Silk was used. The portion removed measured 4.5 by 3.5 centimetres. The peritoneal cavity was washed out and closed.

Convalescence was uneventful, the temperature never going above 101° F., and reaching normal in four days.

DR. ERDMANN said he wished to emphasize the point brought out by Dr. Blake, that digestive symptoms may be entirely absent in these cases. At a recent meeting of the Surgical Section of the New York Academy of Medicine, this question came up for discussion, and one of the speakers had insisted that in all cases of ulcer of the duodenum or the duodenal portion of the stomach the gastric symptoms were well marked. Dr. Erdmann said this was not in accord with his own experience, which covered six cases, in five of which he had operated. In all of the cases the perforation was in the duodenum, and in none of them were there any digestive disturbances; no vomiting or intestinal discharge. In the case of perforation of the stomach which he had just presented, there were absolutely no gastric symptoms. The only point of interest in the patient's previous history was that nine years ago

he got rid of a tapeworm. In his remarks regarding the absence of gastric symptoms, Dr. Erdmann said he limited himself to cases in which the perforation was in the duodenum or near the duodenal orifice of the stomach.

DR. HOTCHKISS said he thought it was Mayo Robson who had called attention to the fact that a perforation of the stomach or duodenum not infrequently simulated appendicitis on account of the rapid gravitation of the liquid to the right iliac fossa and gave rise to acute symptoms in that region.

The speaker said he was glad to note the fact that in Dr. Blake's case, as well as the one shown by Dr. Erdmann, the wound was closed without drainage. In the only two cases of this kind that had come under his care, Dr. Hotchkiss said he had resorted to immediate closure of the wound. In one of the cases Morrison's pouch was filled with débris; this was sponged out, washed with H_2O_2 , followed by abundant salt solution, and the wound closed entirely. This patient recovered. In the second case, which was one of perforation of the posterior wall of the stomach, with a very wide-spread peritonitis, the patient died in twenty-four hours.

DR. BLAKE said that in a case which he recently had in the hospital the perforation had existed for a week at the time of operating. There was a large collection of pus in the left upper segment of the abdomen, which ruptured into the general peritoneal cavity on the day of the patient's admission to the hospital. The peritoneal cavity was freely washed out and drained, and for the following ten days her condition was so satisfactory that her recovery was predicted. On the tenth day, however, she was moved to another ward, and exerted herself to some extent, possibly breaking down some adhesions. At all events, on the following day her pulse and temperature went up, and she died four or five days later of general sepsis.

DR. ERDMANN said that in certain instances, after perforation of the stomach, the *Bacillus pyocyaneus* had been found in the discharged gastric contents. In one of his own cases these bacilli were found in large numbers, and the patient died in a peculiar condition of coma, which was attributed to the presence of this micro-organism.

ADÉNOLIPOMATOSE SYMÉTRIQUE.

DR. ERDMANN presented a man, thirty-one years old, an alcoholic, who, about August, 1902, noticed that his neck had enlarged to a great extent, requiring several sizes increase in his collar. He thinks it grew to twice its size in thirty days. No pain in the growths, but they are uncomfortable. There is no pain or difficulty in swallowing or speaking. The first evidences of enlargement were noticed behind and below the ears. His wife had noticed an enlargement of his neck for a year.

Examination now shows a series of semifluctuating, lipomatous-like, circumscribed masses, bilateral in their arrangement in the following situations: postcervical and suboccipital, anterolateral cervical, submental region, supraclavicular, and some few nodules on the chest wall. These tumors the patient states apparently increased and then decreased in size. These masses, as a result of their symmetrical arrangement and their anatomicopathological structure, have been given the name, by the French, of adénolipomatose symétrique. This condition is usually found in the male, and patients suffering from the disease are said to be prone to tuberculosis.

DIFFUSE PERITONITIS.

DR. BLAKE presented a girl, aged twelve years, who was admitted to his service at the Roosevelt Hospital, July 2, 1902, at 11 P.M., with a diagnosis of gangrenous appendicitis and spreading peritonitis. She had had one attack of appendicitis four years before. The present attack was of two days' duration, commencing with characteristic pain and vomiting, which persisted until admission.

On admission, her temperature was 101.6° F.; pulse, 124; respiration, 44. There was a marked degree of prostration, facies abdominalis, tongue coated, lips red and dry. There was no general abdominal distention; the liver-dulness was normal, general abdominal rigidity and tenderness most marked in right iliac fossa. In view of Dr. Ochsner's and Dr. Mayo's views expressed at the last meeting of the American Medical Association, he decided to try their treatment of such cases. Therefore the stomach was washed out, the rectum was emptied with a simple enema, and an ice-bag applied.

Ten hours later the abdomen was distended, and there was loss of liver-dulness; the pulse was 144, irregular, of poor force, and the respirations were 36.

Operation was then performed. Kammerer incision three inches in length. The appendix was found perforated; the whole right side of the abdomen and pelvis was full of yellow pus; the left side, and even the region about the spleen, was filled with white pus.

The parietal and visceral peritoneum was congested and covered with fibrinous plaques. After removal of the appendix, the abdomen was washed out with large quantities of saline solution until the return was clear; it was then partially dried. The abdominal wound was then closed in layers. *No drainage was employed.* The duration of the operation was thirty-one minutes. During the operation a large saline infusion was given.

The after-course was characterized by marked sepsis. The abdominal wound, infected apparently from the peritoneal cavity, suppurated. Finally, in two weeks there was improvement, and then shortly the temperature began to become irregular and rise, and an indefinite mass was made out in the left iliac fossa. The original wound by this time was nearly healed.

An incision was made in the left side, and an abscess in the left iliac fossa and upper part of the pelvis was evacuated. This was followed by temporary improvement, but in a short time another abscess was found and emptied, which was situated above the other and separated from it by the sigmoid mesocolon. The convalescence after this was gradual but steady, and she left the hospital on August 31, nearly nine weeks after her admission.

The chief points of interest in this case are, firstly, the delaying of the operation, which in this case certainly did not better the patient's condition; secondly, the closure of the abdomen without drainage, and the development of secondary abscesses at a point which would not have been drained had drainage been instituted.

The speaker said that he had treated a number of such cases without drainage, and, as far as he could state at present, the percentage of recoveries was greater than with drainage.

In these cases deep infection of the abdominal wound is apt to occur, apparently from the peritoneal cavity. In one other case, done at about the same time as this, a subphrenic abscess

developed as a late complication, which was opened, and the patient made a good recovery. In his other cases no such complication had arisen.

DR. HOTCHKISS said that in a recent case of diffuse peritonitis which was not as extensive as the one shown by Dr. Blake, he sewed up the peritoneum, and then drained the space external to it. He thought that by this practice, in certain cases, infection of the wound might be avoided.

After the appendix had been removed, he thought the absorptive power of the peritoneum could be relied upon to deal with remaining fluids far better than artificial drainage; and he regarded the removal of the diseased appendix in every possible case as the essential feature to the success of the procedure.

DR. BLAKE said that in these cases of diffuse peritonitis he was in favor of draining the superficial wound after closing the peritoneum. Before he resorted to this method, he had in a number of instances suppuration of the wound follow complete closure of the abdomen. By draining the external wound, however, his results had been better.

Dr. Blake said the peritoneum seemed to possess a wonderful power in the way of getting rid of infectious products. The most essential thing, in dealing with these cases, was to remove the source of the infection. Ochsner and Mayo had reported cases of diffuse peritonitis in which they obtained good results by washing out the stomach, and then keeping the patient completely at rest for a few days before undertaking an operation. The speaker said that in the case he had shown, he started in to treat the patient along those lines, but the outlook after ten hours became so serious that an operation was immediately done to save the patient's life. In those cases where the operation is delayed, the peritoneum must not only take care of the exudate, but also of the cause of the infection. It therefore seemed reasonable to remove the appendix, if that is the cause, and then institute the rest treatment of the peritoneum.

RUPTURE OF THE INTERNAL MENISCUS OF LEFT KNEE.

DR. BLAKE presented a young man who was operated upon by him three weeks before for a rupture of the internal meniscus of the left knee. Seven weeks before he had slipped on an icy side-walk, and a man who was walking with him fell against his

extended leg, causing a severe wrench of the knee; this was followed by an effusion into the joint and an inability to extend the leg on thigh within twenty degrees of the normal, which deformity persisted until the operation.

At the operation the internal meniscus was found split for practically its whole length, the fissure extending through the thick peripheral portion about two millimetres from the attachment of the coronary ligaments. The split-off portion remained attached at both extremities in front of and behind the crucial ligaments. These attachments were divided with a tenotome, and the fragment, which was five centimetres long and a centimetre wide at its widest part, removed. The sharp edge of the fragment was frayed out, evidently from inclusion and pressure between the tibia and fibula.

The wound healing was perfect. The motions are unimpeded, except extreme flexion beyond ninety degrees, and he is now beginning to walk without inconvenience.

PRIMARY TYPHOIDAL PERFORATION OF THE GALL-BLADDER.

DR. JOHN F. ERDMANN read a paper with the above title, for which see page 878.

DR. BLAKE asked Dr. Erdmann whether there was much inflammation or gangrene of the gall-bladder wall in the case he had reported in his paper. The speaker said he had had two cases of spontaneous rupture of the gall-bladder, and in neither of them was there any necrosis of the bladder-wall. One case was that of an elderly woman whose gall-bladder was somewhat distended. In the other case, which was still under treatment, there were no stones in the gall-bladder, but there were some evidences of a cholecystitis. The contents of the bladder had not escaped, this having been prevented by adhesions to the lesser omentum. In both cases the gall-bladder was removed. In the first case, the rupture had existed for a week, and a general peritonitis had followed the secondary rupture of a localized purulent collection. The patient died. In the second case, the contents of the gall-bladder were clear, and the patient was making an uneventful recovery.

DR. ERDMANN, in reply to Dr. Blake, said the mucous surface of the gall-bladder was studded with a number of small

ulcers, which had evidently originated in the follicles, and one of these had burrowed down through the mucous and muscular coats, leaving only the serous coat, which had become distended with bile and finally ruptured. The tissues of the gall-bladder were very friable. There were no adhesions.

DR. ROYAL WHITMAN said that apparently this condition of primary typhoidal perforation of the gall-bladder could only be positively recognized by direct examination, either at autopsy or operation. It did not follow, then, that because twenty-seven non-operative cases had been discovered at autopsy, all cases died from this complication. The statistics quoted were therefore of little value other than to prove that a certain proportion of operative cases recovered. His criticism was, of course, purely from a statistical stand-point.

LITTRÉ'S HERNIA (STRANGULATED PARTIAL ENTEROCELE).

DR. HOTCHKISS presented a specimen with the following history: A man, sixty-four years old, was admitted to hospital during the evening of February 9 of the present year with a history of having suffered for three years from a small hernia which had always been easily reducible, but on the previous evening (February 8), while the patient was at supper, it slipped from underneath the truss, and he was unable to replace it. It began to swell, and a small cyst-like tumor appeared in the upper part of the scrotum, which was irreducible. The following morning he commenced to vomit, and had a little pain in the left side of the abdomen, but none over the tumor, which was slightly tender on pressure. The bowels were moved by an enema, but no gas was passed.

On admission to the hospital, there was no abdominal distention, and the pain was inconsiderable. A cyst-like, rather tender mass was felt in the scrotum. No hernia was palpable in the canal at that time. The patient's temperature was 100° F. He was put to bed and given an enema, which produced a large movement, but no gas. He slept fairly well that night, and the following morning he did not vomit or complain of any pain. The abdomen was slightly tender, but there was no distention, and no mass could be felt in the ring. The canal appeared to be occupied by a somewhat tender and slightly enlarged cord. The

patient soon afterwards began to suffer from hiccough, and when Dr. Hotchkiss first saw him on Tuesday afternoon, it was decided to operate. The cyst proved to be the hernial sac, distended with bloody fluid, and when the canal was slit up, a knuckle of what proved to be small intestine, bluish in color, was found tightly grasped in the neck. The case was a typical partial enterocele, involving two-thirds the cylinder of the small gut. This was gangrenous, and necessitated a resection and an end-to-end anastomosis with Murphy's button.

DR. GEORGE D. STEWART referred to a similar case which he saw at St. Vincent's Hospital. The patient was a woman, who had a swelling which was regarded as an inflamed gland by one physician whom she consulted. There was no obstruction of the bowels, no tympanites, and very little pain or temperature. After forty-eight hours her symptoms became slightly aggravated, and an incision revealed a femoral hernia. The loop of small intestine, which was pinched in the femoral ring, had only been partially occluded, which explained the mild symptoms.

In another case recalled by Dr. Stewart, the patient was a man who was suffering from inguinal hernia. The symptoms were very severe, and an immediate operation was done. Nothing but omentum was found in the hernial sac, and the condition of the omentum was not such as to explain the symptoms of shock and sepsis from which the patient was evidently suffering. A further search was thereupon made, and at the bottom of the hernial sac some curious bodies were found, which proved to be pieces of chestnuts that he had eaten a few days before. These had escaped through a disk-shaped perforation in the small intestine. The latter had become reduced after sloughing was complete, and had infected the entire peritoneum. The man died in a few hours of a general peritonitis.

DR. WOOLSEY said he had seen two cases of Littré's hernia, one inguinal and one femoral. The latter was in a woman in whom the gut could be replaced after being enveloped in gauze moistened in hot saline solution over night. The speaker said he had recently operated on a curious hernia of the inguinal region which had been completely strangulated for six days. There was a tense swelling behind the external ring and the inguinal canal. On slitting up the latter, a large sac was exposed lying still further outward and upward and containing a mass of omentum

and a loop of purplish gut. This sac lay behind the conjoined tendon, and apparently in front of the transversalis fascia. The internal ring, where the constriction occurred, was just internal to and nearly on a horizontal line with the anterior superior iliac spine. At this constriction the gut was gangrenous and perforated. The omentum was resected, also eight inches of the small intestine, and an end-to-end anastomosis made with a Murphy button. There was considerable hæmorrhagic infiltration of the mesentery, corresponding to the resected gut, which was also removed.

About twelve hours after the operation flatus passed freely, and the bowels were moved during the next twelve hours. From this time on the progress was favorable, the bowels moving regularly for the first five days. On the sixth day the patient suddenly became worse and died. On the autopsy, the button was found five or six inches below the line of anastomosis, and there was a small perforation just above where the button lay. The cause of this perforation could not be determined. The line of anastomosis was tight, but could be easily separated by moderate traction.

Stated Meeting, February 25, 1903.

The President, LUCIUS W. HOTCHKISS, M.D., in the Chair.

IMMUNITY FROM RECURRENCE AFTER REMOVAL OF GLANDULAR SARCOMA OF THE NECK.

DR. FORBES HAWKES presented a woman, forty-one years old, who was first seen by him in 1898, when she had a tumor, about the size of a hen's egg, on the left side of the neck, which she stated she had first noticed about a year before. The growth was removed and submitted to Dr. Thatcher and Dr. Tuttle, who pronounced it a glandular sarcoma of the small, round-celled variety. Almost five years had elapsed since the operation, and there were no signs of a recurrence.

DR. F. KAMMERER said that his personal experience with

sarcomatous growths originating in the glands of the neck had been very unsatisfactory. In spite of very thorough removal, there was usually prompt recurrence. In dealing with these cases, the speaker referred to the importance of giving potassium iodide a thorough test, so as to exclude the possibility of syphilis. He referred to a case of his own in which a growth of the neck which was regarded as a sarcoma had disappeared after a few weeks of the iodide treatment. Esmarch many years ago had called attention to this class of tumors.

DR. ROBERT H. M. DAWBARN said he thought it was always worth while in these cases to give the iodide treatment a trial, no matter what the report of the pathologist might be. He recalled a case reported by Dr. Gerster where a man had a growth involving the thigh. It was apparently a round-celled sarcoma, and a competent pathologist who was given a section for microscopic examination said there was no doubt as to the diagnosis. Before amputating the limb, however, it was thought worth while to try potassium iodide, and under this treatment the growth rapidly disappeared, and no recurrence had taken place.

BONE CYST OF THE SUPERIOR MAXILLA.

DR. HAWKES presented a man, forty years old, who four months ago first noticed a swelling on the upper jaw on the right side, which gradually increased in size until the lip bulged out fully one inch. It gave rise to only slight pain, and his health was not impaired. There was no pain in the teeth.

When Dr. Hawkes first saw the patient, on February 6 of the present year, an examination of the growth showed that it was apparently cystic. Upon the insertion of a needle, about an ounce and one-half of yellowish, mucoid fluid were withdrawn. An incision was thereupon made into the cyst through its anterior wall, which contained no bony tissue. This revealed a deep cavity (capacity about two ounces) involving the antrum, where the cyst had probably originated. There was no suspicion of malignancy.

DR. DAWBARN inquired whether there was any softening of the bone in the case shown by Dr. Hawkes. The speaker said that in a number of cases he had found that one of the very earliest signs of malignancy in this region was the softening of the bone, which could be readily determined by means of an

ordinary sewing-needle. As a standard of comparison, the opposite jaw-bone could be used. In a case which he showed here a few years ago, the diagnosis of a malignant growth of the bone of the upper jaw was made by this test alone, as the growth filling the antrum had as yet produced no outside swelling. The microscope subsequently showed that it was a round-celled sarcoma. In that case the needle was passed through the upper jaw with comparative ease,—about the same degree of resistance as with cartilage.

DR. HAWKES said that in the anterior part of the cyst (that is the portion above the teeth) there was no bone tissue at all. After the soft contents of the cyst had been removed, there was a thin layer of fibrous tissue, which was wiped off with the sponge. The bone surrounding the cyst was quite hard, even harder than normal bone, and it did not present any appearance of malignancy.

In another similar case, which he hoped to show later, the cyst originated in the upper part of the superior maxilla. The outer layer of bone had become absorbed, and the cyst was lined with a light layer of fibrous tissue. In that instance the wound healed in about three weeks, and there was no recurrence.

SUPERNUMERARY THUMB (ADULT).

DR. HAWKES presented a man, twenty-five years old, from whose right hand a supernumerary thumb had been removed. The patient was a butler by occupation, and the extra thumb had inconvenienced him in the proper discharge of his duties. The accompanying cuts (Figs. 1 and 2) show the condition.

GASTRO-ENTEROSTOMY FOR BENIGN STENOSIS OF THE PYLORUS.

DR. GEORGE WOOLSEY presented a man, fifty-two years old, who was referred to him for operation by Dr. William Armstrong in January, 1902. The history he gave was that he had been sick for over a year, his most pronounced symptom being frequent vomiting. The vomited matter frequently consisted of food that had been taken twenty-four or forty-eight hours previously. According to Dr. Armstrong's report, repeated chemical analyses of the stomach contents showed a normal or slightly increased percentage of free HCl, and a good digestion of the test meal.



FIG. 1.—Supernumerary thumb.



Right thumb. Left thumb.
FIG. 2.—X-ray photograph of thumb, taken before operation.

The lower margin of the stomach reached four inches below the umbilicus, but the motility of the organ was not greatly impaired.

As the patient failed to improve under medical treatment, it was decided to operate. The stomach was opened through a median incision, and upon inspection the pylorus was found to be much thickened and stenosed and somewhat bound by adhesions. A gastro-enterostomy was thereupon done, the jejunum being attached, by means of a Murphy button, to the anterior wall of the stomach at its most dependent portion, close to the greater curvature. The patient's convalescence was uninterrupted, and his stomach symptoms have practically disappeared. The button was passed on the twenty-second day. Since the operation, the stomach has greatly diminished in size, and the patient has gained over fifty pounds in weight.

Dr. Woolsey said he had shown this patient principally to illustrate the fact that it made no difference whether an anterior or posterior gastro-enterostomy was done, providing the opening was made at the most dependent part of the stomach, so that good drainage was secured. This point had recently been emphasized by Mayo.

Dr. F. KAMMERER said he did not appreciate the force of the argument that when the stomach was low down, as in Dr. Woolsey's case, the anterior operation was easier than the posterior one. On the contrary, he thought that the pendulous stomach could more readily be lifted out of the abdominal cavity, and this would facilitate the posterior operation. The speaker said that he had formerly done the anterior operation many times, but during the past six or eight years had abandoned it entirely in favor of the posterior method. Others had come to the same conclusion, notably Czerny. Others again, for example Mikulicz and Mayo, had found that results equally as good could be obtained by the anterior operation. For some reason or other, this had certainly not been the speaker's experience, although it had always been his aim to establish the anastomosis at the most dependent point of the stomach in the anterior operation. Still, with the patient in the recumbent position, posterior gastro-enterostomy did seem to place the outlet at the lowest point. This, in the weakened condition of the muscular walls of the stomach, was perhaps of some importance.

Dr. BROWN said that in cases where the stomach was opened

anteriorly for some other purpose, such as pyloric ulcer, and the indications for a gastro-enterostomy then became apparent, he would use the anterior opening for the anastomosis rather than make a second posterior opening for that purpose. When the omentum was voluminous or heavy, he preferred to make a slit through this tunic close to the inferior margin of the transverse colon, and lead the loop of jejunum through rather than under the entire omentum.

DR. WOOLSEY said he had practised the posterior operation until he read Mayo's article on the subject. Since then he had done the anterior operation entirely, and he had never had any vicious circle in any of his cases. He had found it easier to do the anterior operation than the posterior one. In the case under discussion, the stomach hung so far down that, in order to get at its posterior surface through the mesocolon, it would have been necessary to lift up not only the omentum and transverse colon, but also the stomach, which hung down over the latter, and to do this a much larger incision would have been required. According to Mayo's statistics, which are the largest of any operator in this country, the results, both as to mortality and function, are quite as favorable for the anterior method as for the posterior, if not more so. The anterior operation was also simpler and easier than the posterior, and Dr. Woolsey said he saw no reason why the button should not pass as readily by one method as by the other, for, if the operation is properly done, the button is at the bottom of a funnel-shaped protrusion at the most dependent part of the stomach.

GANGRENOUS PANCREATITIS, WITH EXTENSIVE RETRO-PERITONEAL NECROSIS.

DR. F. TILDEN BROWN presented a woman, thirty-four years of age, who was admitted to the medical service of the Presbyterian Hospital on August 18, 1902. Some two years before she had received a blow on the left margin of the epigastrium from the edge of an iron sauce-pan. This was severe enough to require her being carried to her rooms, and a miscarriage occurred shortly after. Although in fairly good health for the next two years, she had all this time moderate epigastric pain. After any exertion, distress in the region of the blow was always noted. In June last, two months before entering hospital, she sat on wet ground to

nurse her two months' old baby. On reaching home from this day's outing in the country, she had a sudden and severe attack of epigastric pain, with vomiting at frequent intervals; the abdomen became distended, and there was total anuria for forty-eight hours. Pain was severe, knife-like, and continuous, but varied in severity. On the second day she became delirious, feverish, and had one or two chills. Normal urination gradually returned, but constipation became very troublesome. Pain and delirium abated, although patient continued to be weak and feverish.

She was in bed for most of two months. On admission to hospital, her temperature was 102.6° F.; pulse, 120; respiration, 25. Abdomen was distended; tympanitic over all except in the flanks, where there was some dullness, not shifting with the position of the patient, and a sense of doughy resistance extending from the retrocostal margin into the pelvic brim. A similar mass was felt in the epigastrium. The urine showed no sugar; there was a trace of albumen.

During stay on medical side her temperature ranged irregularly between 101° and 104.6° F., with mild, chilly sensation; sweating and marked prostration. Constipation was very extreme, needing internal catharsis, and bowels moving only with large enemata. Distention increased and the patient grew progressively weaker. Dr. Brown saw her on August 30, and, without making a diagnosis, advocated exploratory laparotomy.

Under chloroform, a median epigastric incision showed normal peritoneum and omentum. Drawing the latter out of the wound and lifting the transverse colon, a short loop of small intestine was noted adherent to the transverse mesocolon to left of the median line; detaching this by traction and the twisting motion of a sponge in long forceps, a drop or two of thin pus was seen to exude from the surface of the mesocolon. Covering this defect with the same sponge, the patient was turned slightly to expose the left loin, where a lumbar retroperitoneal incision opened into a large abscess cavity, from which a quart or more of very foul, stinking, thin brownish pus was evacuated, together with a number of large white shreddy masses of greasy consistency. Some of this material was lying unattached in the retroperitoneal iliac fossa and was removed with long forceps. The cavity was irrigated and provided with several large, long rubber drainage tubes lightly held in place with sterile gauze. The anterior incision was

closed in layers, except for a small cigarette drain to the site of the small perforation. Although in bad condition, the patient responded to stimulation. For the following week or more the pre-existing constipation disappeared. Temperature ran from 102° to 105° F. for a few days, and then gradually fell until some two weeks later, when it began to rise again, and the patient's general condition, which had greatly improved, showed deterioration. The left lumbar wound was draining freely, and several more necrotic masses of large size had come away. The pathologist recognized in some of these pancreatic tissue.

The doughy fulness in the right loin seemed again to be more manifest, especially low down, and on September 27 an incision was made in the right loin opening into an abscess, the contents of which were exactly the same as those found on the opposite side, while somewhat less in quantity. Much of the retroperitoneal areolar tissue seemed to have been detached and converted into necrotic greasy masses. The psoas muscle and part of the quadratus lumborum stood out without surrounding attachments.

After this the patient very slowly but steadily improved and gained strength. The wounds drained freely, extensive sinuses, six to eight inches deep, remained for several months. There was considerable passive congestion of the lungs for the first eight or ten weeks. At one time there was consolidation at the left base as far as the angle of the scapula, and temperature reached 104.3° F.; but she gradually rallied, and convalescence continued until her discharge on January 5, 1903.

At no time was there any sugar in the urine or fat in the stools.

The highest leucocyte count was 14,000, two days before the second operation. The abdominal wound is firm. That in the right flank is still discharging slightly. She has gained about thirty-five pounds, and now weighs 130 pounds. No growths resulted from cultures made at time of operation. She formerly weighed nearly 200 pounds.

The surgical aspects of this case would induce the speaker to urge the importance of retroperitoneal access and drainage, not alone in such cases as the present, where intraperitoneal rupture was just about to occur, but in those where this has already happened, involving either the greater or lesser cavities, and particularly if the surgeon, on opening the abdomen, finds evidence

pointing to an earlier localization of peripancreatic suppuration on the other side of the peritoneum.

While in such a case of rupture attention must be given to the immediate management of the intraperitoneal complication, simultaneous provision for subsequent lumbar diversion of the drainage will tend to avoid the greater absorptive risks, as well as the many compromises, such as hernia and intestinal adhesions, incidental to long-continued transperitoneal drainage.

DR. WOOLSEY said that he had seen the patient previous to the operation, and in the history she gave, the most important point brought out apparently was that she had sat on wet ground during a day's outing in the country, and that this exposure was followed by a sudden and severe attack of epigastric pain. There was a good deal of distention, and in the left flank a sense of resistance, which seemed to extend in the shape of a pedicle towards the median line. This, together with the history of anuria, seemed to point to the kidney as the source of the trouble. The speaker said he did not have the slightest idea that the case was one of pancreatitis. Everything pointed to the kidney.

EXCISION OF PATELLA IN EXTENSIVE WOUND OF KNEE.

DR. W. G. LE BOUTILLIER presented a man, thirty years old, who, on October 27, 1902, was struck by a falling rock in the subway, receiving an extensive lacerated wound of the right knee-joint. He was removed to hospital, and after cutting away the lacerated shreds of tissue it was found that a large part of the capsule of the joint over the external condyle was entirely missing. There was a transverse fracture of the patella, and both fragments of the bone were lacerated to such an extent that they were removed. There was practically no reaction after the operation. On the nineteenth day, skin-grafts were applied to the extensive raw surface. Motion of the limb is still much restricted, although he is able to extend it very well and flex it slightly. In reply to a question, Dr. Le Boutillier said that extension was now brought about by the vastus internus. The skin-grafts were applied directly to the granulations, and the restriction of motion was probably at least partly due to adhesions of the cicatrix to the condyles of the femur.

RESECTION OF INTESTINE FOR STRANGULATION BY A BAND.

DR. BENJAMIN T. TILTON presented a man, fifty years of age, who had always enjoyed good health until the 30th of September, 1902. On that date he felt a sudden sharp pain in the abdomen, and soon afterwards began to vomit. The pain gradually increased in severity and the vomiting continued. The following morning he was brought to the hospital, and when Dr. Tilton saw him at eleven o'clock in the morning, about twenty-four hours had elapsed since the onset of his symptoms. At this time the patient's temperature was 101° F.; pulse, 120. The entire abdomen was extremely tender and tympanitic on percussion. A tumor was made out just beneath the umbilicus.

Upon opening the abdomen, a coil of blackened intestine was found, which proved to be the lower end of the ileum. It was tightly constricted by a band running across the mesentery, and when this constriction was relieved, the color of the bowel did not improve. About twenty-five inches of the small intestine, terminating below at the cæcum, were resected, and the divided ends brought together over a Murphy button. The mesentery was found to be so much congested that a large part of it had to be removed to prevent sloughing. The abdomen was closed with a small drain, and the patient made an uneventful recovery from the operation. The button was passed on the twenty-first day. Since the operation, the patient had gained ten pounds in weight.

Dr. Tilton said he had no idea what caused the adhesive band to form. The patient gave no previous history of appendicitis or other intra-abdominal trouble. The speaker said that in three cases of this kind upon which he had operated, he had inserted a gauze drain down to the seat of anastomosis, and he had never seen a fæcal fistula result.

BULLET IN BRAIN.

DR. B. FARQUHAR CURTIS presented a patient whose case Dr. Curtis had reported at a meeting of the Society two months previous. The man was shot in the back of the head. For two months after receipt of the injury he was delirious. The bullet punctured the longitudinal sinus and produced a right-sided hemianopsia, which still inconveniences the patient to some extent.

Otherwise, he had entirely recovered. Two skiagraphs were taken by different men, both experienced operators, and both pictures agreed as to the position of the bullet in the brain. An exploratory operation was done to remove the bullet, but this proved unsuccessful. It is still embedded in the brain, and apparently gives the patient no trouble.

DISTENTION OF THE MAXILLARY ANTRUM.

DR. CHARLES H. PECK presented a woman, nineteen years of age, who was admitted to the French Hospital, February 18, 1903, presenting a marked bony prominence on anterior aspect of right superior maxilla, of three weeks' duration, without pain, tenderness, or other symptoms except the facial deformity produced by the mass, which was about the size of half an English walnut. No evidence of pressure on nasal fossa, orbit, or palatine plate. The day before admission, the second bicuspid tooth was withdrawn by a dentist; patient stating that no fluid escaped at the time.

February 21 the patient was etherized, and an incision made over the mass at the reflection of the mucous membrane from cheek to gum, and carried immediately through an extremely thin shell of bone, which crackled like an egg-shell on pressure, into the antrum. The opening was enlarged and the finger inserted; the cavity was empty, no fluid escaping; the mucous membrane appeared normal, both to the touch and appearance by reflected light; there was no bulging nor deformity of orbital, nasal, or palatine walls, but the orbital plate had the egg-shell crackle on pressure. A director passed easily from middle meatus into the antrum, and also through the tooth socket of second bicuspid.

The entire anterior bony wall was as thin as paper, but the bone seemed normal in consistence. The surrounding soft parts seemed perfectly normal.

The incision was closed by suture, and drainage established through tooth socket.

DR. HAWKES thought the case reported by Dr. Peck was one of bone cyst, with as yet incomplete absorption of the bone. It was very similar to the case he had shown, but the process here had apparently not advanced so far. The contents had probably escaped very gradually through the opening made by removing the tooth.

DR. PECK said he was inclined to accept Dr. Hawkes's explanation of the bulging as the correct one. As regards the appearance of the bone, it was very thin, but apparently just as firm as normal bone. The tissues attached to the bone appeared to be perfectly normal, and nothing in their appearance suggested a tumor. The speaker said he regarded it as a case of distention of the maxillary antrum from pressure of some sort within the antrum.

HÆMORRHAGE FROM BULLET WOUND OF RENAL VESSELS.

DR. F. TILDEN BROWN said that wounds of this nature were rare enough to induce him to present a woman, thirty-six years old, who was brought to his service in the Presbyterian Hospital July 14, 1900, about two hours after receiving two penetrating wounds from a .38-caliber pistol at about fifteen feet range. She was shot in the back when descending a short flight of stairs. On admission the patient manifested some degree of shock; pulse was very small and feeble; breathing rapid; but patient was not exsanguinated, and there was no bleeding from the mouth. Posteriorly, on the right side, respiratory sounds were poor; there were no râles.

On the right scapula, just below the middle of its spine, was one wound of entrance, one-third of an inch in diameter, and below the right twelfth rib, three inches from the vertebral spinous process, was a similar bullet wound of entrance. No wound of exit could be found.

The patient's abdomen was held very rigid. From the ensiform cartilage to a point two inches below the umbilicus and to the right there was flat percussion. An immediate operation was made under chloroform changed to ether anæsthesia. Below the right costal margin a vertical incision was made; on parting the fibres of the right rectus, it happened to expose in part the track of one bullet in this muscle, but its course in the parietes was not pursued; it had evidently not re-entered the abdomen. Several moderate-sized blood-clots were found in the concavity of the right lobe of the liver, derived apparently from a superficial wound of the inferior margin of this organ. No other wound of the intraperitoneal viscera was found, but a large retroperitoneal hæmatoma had been recognized on opening the abdomen. With

hasty closure of the first incision, the patient was turned for surgical exposure of the right lumbar retroperitoneal space. On reaching the kidney, hæmorrhage was profuse, and was found to come from one or more renal veins or some large vein in close apposition. The bleeding was controlled by three clamps, which were left *in situ* on the posterior aspect of the kidney and its pedicle. A light packing of sterile gauze encased the clamps, and the wound closed with chromic gut, except at the upper angle. During the latter part of operation, the patient had 1200 cubic centimetres intravenous saline infusion. The patient's pulse was imperceptible on return to ward, but responded to vigorous stimulation and large hot saline enemata. For two days shock was marked and the pulse very small; on the third day, moderate general improvement. The clamps were now removed, and the bowels moved by a cathartic; on the fifth day patient was hungry and generously fed. Both wounds healed satisfactorily. On the fifteenth day, signs of fluid in the right chest having appeared, ten ounces of dark-brown fluid were removed by aspiration; five days later a somewhat smaller quantity was obtained. The temperature on admission was 100° F.; respiration, 36. On the third day, temperature was 103° F.; pulse, 120. For twelve days the temperature ranged between 101° and 103° F.; pulse, 120 to 96. The highest temperature, 104° F., was just previous to the first aspiration, after which it gradually fell to normal.

The urine on admission was acid; specific gravity, 1024; heavy trace of albumen and a few granular casts. The day following operation, specific gravity 1022; albumen; red blood-cells abundant. Five days later, specific gravity 1014; neutral; trace of albumen; few leucocytes.

Three months after being shot, patient presented with a bullet bulging beneath the skin at the umbilicus. A radiograph made by Dr. H. B. Johnson, one month later, showed the remaining bullet at the inner margin of the right scapula. Repeated physical examination since showed nothing abnormal in the right chest.

PIN IN THE ABDOMINAL CAVITY.

DR. WOOLSEY said that on December 25 last he operated on a woman who had been referred to him with the diagnosis of ovarian cyst. Upon examination, he was unable to find any evi-

dences of such a cyst, but on the right side of the pelvis there was a hard, painful mass. Upon opening the abdomen in the median line, he found several coils of small intestine which were very adherent to a mass in the right half of the pelvis. The cæcum was drawn down over the brim of the pelvis. After freeing the adherent intestines, he found an abscess, and upon opening this and introducing the finger he felt a hard body, which proved to be an ordinary pin, very much encrusted with a blackish material. In front and to the right of the abscess, and forming a part of its wall, was the appendix, which was removed; it was much enlarged, and its walls thickened and chronically inflamed. The wound was closed, with drainage, and the patient made an uneventful recovery. This woman had long been in the habit of putting pins into her mouth. This one had probably found its way into the abdominal cavity through the appendix, carrying infection with it.

NEEDLE AND THREAD REMOVED FROM AN ABSCESS UNDER THE LIVER.

DR. HAWKES reported the case of an Italian laborer who was admitted to the Presbyterian Hospital with the history that one month previous, after sewing a button on his vest, he had left the needle sticking in his tie. Soon afterwards he had a fight with a fellow-laborer, who struck him in the epigastrium. The blow gave rise to a sharp, pricking sensation, and he noticed a day or so later a small scratch on the abdomen. Two weeks later he developed symptoms of intra-abdominal trouble, and an operation revealed an abscess just under the liver, which contained about a pint and one-half of greenish pus, together with a needle and a piece of black thread.

TACK IN THE APPENDIX.

DR. CHARLES H. PECK said that last summer he operated upon a patient for appendicitis. The history was that for five years back the patient had suffered from several severe attacks, with colicky pains, but no inflammatory symptoms; the operation was an interval one. The appendix was found to be unusually large and long, but not inflamed. Upon opening it, a sharp, rather long upholstery tack was found, with two small concretions distal to it. It had evidently been there a long time without giving rise to any inflammatory trouble.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting, March 2, 1903.

The President, RICHARD H. HARTE, M.D., in the Chair.

PAPILLOMA OF THE VULVA IN A CHILD.

DR. GEORGE ERETY SHOEMAKER reported the case of a girl, aged six, who was seen with her physician because of a bleeding growth protruding from the vagina, accompanied by a persistent irritating discharge. The general health of the child had been impaired for a year, and adenoids of the nasopharynx had been recently removed by another surgeon. About eight months before a white vaginal discharge had appeared, and had since resisted treatment at the hands of various physicians. Bleeding had appeared six weeks before his visit, but the growth had been noted only for a few days, and had increased decidedly.

Examination showed several soft, easily bleeding, prominent papillomatous masses occluding the vulvar cleft. There was no involvement of the skin surfaces, or of the anus. The masses were pale pink in color, sharply elevated, pedunculated, and quite fragile, while some were flattened from side to side and serrated on top like the comb of a cock. One rounded portion half an inch in diameter sprang from within the urethra by a stem. Smaller growths sprang from pits beside the urethra, while inside the posterior commissure the bases of others, which were large and irregular, were attached. None appeared higher in the vagina. The discharge showed diplococci within the cells of typical gonorrhœal character.

After twisting off the growths, their bases were burned with the thermocautery, the one springing from the urethra being, however, tied off to avoid contraction. Protargol solution was

ordered for the discharge. Recovery was prompt. The reporter added that these vascular tumors of the urethra were said by Pozzi to occur in poorly nourished children, and to be due to irritating discharges. They are more common in the adult. It is not thought necessary by some authors to consider them venereal in origin, though they are apt to accompany gonorrhœal or syphilitic disease. Two varieties are described, the flat condylomata which are of syphilitic origin and frequently spread over the perineum and about the anus. The acuminate variety assumes a more typical papillomatous form and is the variety seen in this case.

The theory that they may occur independent of gonorrhœa is quite doubtful. Gynæcologists who have had occasion to make systematic microscopical tests of apparently innocent vaginal discharges have been many times impressed with the impossibility of excluding gonorrhœa by the macroscopical appearance of the surfaces involved or of the discharge; and if they were subjected to careful search, it is probable that all cases would show the gonococcus at some period of their history.

Boldt says (Keating and Coe, "Clinical Gynæcology," page 528) of these condylomata that observation has shown their occurrence even in children, though bacteriologists have not yet succeeded in proving the presence of gonococci in pointed condylomata. This case would seem to prove the presence of this exciting cause. Dr. J. Dutton Steele, of the Pathological Laboratory of the Presbyterian Hospital, kindly examined the growths and pronounced them papillomata with round-cell infiltration at some points.

The child was remarkably submissive to free exposure and examination, which suggested the possibility that she had been accustomed to handling, and that gonorrhœal infection might not have been accidental.

THE DRAINAGE OF THE CHEST IN EMPYEMA WITHOUT THE USE OF TUBES.

DR. LEON BRINKMAN read a paper on the above subject.

After reviewing the state of present knowledge and practice in cases of empyema of the thorax, he continued with a description of a method whereby immediate adequate drainage could be secured without the use of drainage tubes.

He said that the operation advocated by Estlander, while a distinct advance in the treatment of empyema, is a very extensive one, and does not present any advantage over the method described below. Among twenty-seven cases in which it had been applied by him there were several in which, had it not been adopted, he would have been compelled to do the Estlander operation, entailing as it does a greater amount of manipulation, destruction of tissue, and a great mortality.

Dr. Carl Beck had devised a method somewhat similar to the one advocated by the author, differing, however, in several vital points. He was not aware of the operation advocated by Beck until in September, 1902, when it was brought to his notice by Dr. Gibbon, of Scranton. He had since gone over the literature carefully, and had found that Dr. Beck had reported his experience with suture of the pleura to the skin as early as 1894; he, however, introduced a drainage tube after three days to avoid hæmorrhage.

The operation recommended by Beck consists in making an incision over the seventh rib, parallel to the rib, reflecting back the superficial structures, denuding the rib of its periosteum, introducing a special scissors beneath the rib, which also served the purpose of a periosteal elevator, and excising four inches of the rib.

The great point of difference between the operation advocated by Beck and the one he was about to describe is, that in the latter additional facility is afforded to manipulate within the chest cavity; that with each inspiratory movement of the chest wall a wider range of lung expansion is possible; a freer inspection of the chest cavity is permitted, making it easy to avoid the formation of pockets and doing away with the necessity for packing the chest cavity.

His own operation for immediate drainage of the chest for empyema is performed after the following manner. The patient having been prepared, a vertical incision is made in the mid-axillary line down to and exposing the fifth, sixth, and seventh ribs, more if necessary. The skin, superficial fascia, and muscles are dissected back on either side of the wound, so as to expose at least two inches of the ribs; the periosteum is freed from the anterior surface of the ribs, to permit the introduction of the periosteal elevator beneath the ribs. An elevator is then carefully

introduced beneath each rib successively, denuding them of their periosteum and underlying structures. The ribs are divided; the pleura is protected from injury by a special elevator, which performs a twofold function,—elevation and fixation of the ribs,—so as to facilitate division of the ribs with bone-cutting forceps.

The pleura having been exposed, a small vertical incision is made in it at the lower angle of the wound, at about the middle of the space, to permit the more gradual escape of the purulent secretion. Upon the complete evacuation of the purulent contents, the incision in the pleura is continued upward until it reaches the upper angle of the wound.

A free inspection of the interior of the chest cavity is now possible by retraction of the wound; if the lung is found fixed and collapsed in the upper portion of the cavity, an attempt should be gently made to separate the adhesions; if these are too firm to permit this, then they must be incised and blunt dissection resorted to, avoiding unnecessary force, which might produce extensive laceration of the lung tissue.

When the condition within the chest cavity is complicated by encysted pockets of pus, either interlobular or between the lung and the posterior chest wall, it may be necessary to go as high as the third rib in the excision.

The operation is completed by stitching the pleura and the skin together around the entire wound, thus offering a large, free opening for the escape of the succeeding secretion. In order to avoid injury to the diaphragm, all incisions are made with this organ in view.

A serous membrane like the pleura, which under normal circumstances has great absorptive powers, is capable of taking up a toxic amount of drug from any fluid thrown into the chest cavity which would contain a sufficiently strong antiseptic to alter the character of the pus. Although the character of the membrane is altered by the inflammatory process, still it is capable of absorption.

In commenting upon the practice of irrigation of the chest cavity, the dangers of this procedure should be well borne in mind; fatal syncope and hemiplegia are prominent among these. From experience, he had found that irrigation of the chest cavity does not diminish the amount of discharge, but rather, on the other hand, favors an increase.

The periosteum must be carefully dissected away, otherwise, during the process of repair and closure of the wound, pain-creating masses of fibrous and calcareous tissues are formed.

During the past five and a half years he had spent considerable time and thought in perfecting the detail of the immediate method of drainage without tubes, and had had an opportunity to compare it with excision and tubular drainage. The total number of cases operated upon for empyema was forty-seven, twenty of which were by excision and tubular drainage, the remaining twenty-seven were by the immediate type of drainage, stitching the pleura to the skin. The results in the latter method had been so conclusive that he believed the benefits from it were unquestionable. Of the twenty-seven cases treated by this method of drainage but two had had a protracted convalescence, and these would have occurred under any method employed. The first was a young girl with a tubercular empyema complicated by extensive tubercular involvement of the base of the right lung. It is now two years since she was operated upon. Her condition at the present time is as follows. A small discharging sinus is seen at about the middle of the scar of the former operation, from which a slight amount of semipurulent material makes its escape. Microscopical examination of the discharge from the sinus and of the sputum fail to reveal tubercle bacilli. Her general condition has improved in the past four months to a remarkable degree, her weight having increased thirty pounds. The area of lung involvement in the impaired lung has decreased to one-half its former dimensions.

The other case occurred likewise in a young female. The empyema was a secondary complication to pneumonia. In addition to the empyema, there was a localized patch of gangrene in the anterior pleural surface of the lung, which upon separation developed into a bronchial fistula. With the gradual decrease in the size of the wound, there has been a perceptible decrease in the amount of discharge and of the air making its escape through the sinus. At the present time there is scarcely any discharge, and air can only be forced through the sinus when the breath is held and forcible compression of the chest wall made. It is now seven months and two weeks since she was operated upon.

The remaining twenty-five cases by this method have all done well, the shortest time for a cure to be established was three weeks and the longest five months.

It will be found necessary in some cases to freshen the edges of the wound and bring them together with sutures, so as to hasten the closure. This was done in five of the twenty-seven cases, the discharge having ceased after three weeks.

DR. HENRY R. WHARTON said that he had found simple incision with the insertion of tubular drainage very satisfactory, especially in cases of empyema in children, though in later years he has often excised a rib. He rarely excises more than one rib, and only from one to two inches are removed. The success of these operations in children depends on the elasticity of the chest wall. Preliminary aspiration is wise in many cases, this being done some hours or even days before the radical operation. He has never practised the operation recommended by Dr. Brinkman, but thinks the only objection to the operation is the time required, for time is a very important element in operations for empyema in children. The danger from irrigation in these cases is very great, and it should not be employed. Decortication of the lung, recommended by Fowler in the case of adults, is theoretically a very good method; but hæmorrhage is apt to be profuse, and the time consumed is necessarily so great as to make the operation dangerous. Resection of ribs and tubular drainage, or stitching the pleura to the skin if that is preferred, are probably the best operations that can be done for the patient. It is a mistake to drain without having broken up adhesions. The incision should be made large enough to allow search for and breaking of adhesions, as prolonged suppuration is often due to their presence.

DR. JOHN H. GIBBON said that the operation recommended by Dr. Brinkman appealed to him, and had in it many points to be commended. In one class of cases, however, he does not think it practicable, namely, the acute empyemas of children. These cases he believes will do as well with tubular drainage as when operated on by the method advocated by Dr. Brinkman. In adults, and where the condition is not so acute, the latter method is no doubt a good one. Dr. Gibbon briefly reported two cases. The first was that of acute empyema in a child of twelve months, which he thinks is an unusually early age for that affection. The child had been extremely ill from pneumonia for a number of weeks. Prior to operation, which consisted of simple incision with tubular drainage, six ounces of pus were aspirated from the pleural cavity. The child was well in six weeks. The second

case was one of sudden death in a child during the application of a dressing three weeks after operation. This case was reported because we generally hear of sudden death in these cases as being due to irrigation. In this instance irrigation had never been employed. The case was one of double empyema, operation upon which illustrated very well the advantage of chloroform anæsthesia and the necessity for rapid operation. Resection of one rib on each side and the opening of an abscess of the shoulder were performed in eleven minutes. The child was taken from the hospital against advice, but was dressed at home by a competent physician. Three weeks after operation the child was turned from one side to the other while being dressed, and died at once. In reply to Dr. Gibbon's question as to age incidence of empyema at the Children's Hospital, Dr. Wharton said that the youngest patient he remembered operating upon was eighteen months of age. The child did perfectly well under simple incision and tubular drainage. Empyema is certainly unusual in children under one year of age.

DR. RICHARD H. HARTE said that as to technique he was convinced that there is nothing better than the straight, mid-axillary incision, provided it gives perfect access to the cavity. Time is of the greatest importance in these operations. With care two or more ribs can be rapidly exposed and a suitable director passed underneath them separating the costal pleura. Then by introducing a heavy pair of bone forceps a section of the ribs can be readily cut and removed, and it is rarely necessary to apply any sutures to the bleeding vessels. The patient can then be turned over on the side, the costal pleura broken through, and the chest contents drained, thus avoiding all the annoyance of air being drawn into the pleura and the unnecessary soiling of the patient by the escaping pus. The greatest care should be taken after the pus has escaped that all masses of fibrin are carefully removed from the pleural cavity with a suitable pair of forceps, since, if masses of fibrin are left, great annoyance will be occasioned by the blocking up and occluding of the drainage tube. This drainage tube should be double and of as large a size as can be obtained. It is advisable to use two tubes side by side, and retain them in position by the suture which is used for closing the skin wound. Care should be taken that the ends are not allowed to irritate the lung, and therefore the tubes should be

used either just passing through the costal pleura or else sufficiently long to drain over and pass down deeply into the pleural cavity, thus avoiding the ends of the tubes coming in contact with the lungs, which is always a source of irritation and discomfort to the patient. In Dr. Harte's experience nearly all cases of empyema heal in a comparatively short time, provided the cases are seen early and before the lung has an opportunity to become tied down by old adhesions, which prevent its expanding and close the pleural space.

DR. BRINKMAN, in rejoinder, said that Dr. Wharton's method would suffice for acute empyema in children. His experience has been mainly with late cases, in which his own method is more applicable. By this method, adhesions, especially those between the lobes, can be easily separated, and the lung allowed to expand, which is the secret of success in these cases. Patients will get well if only a simple incision be made, but the method described facilitates recovery. The operation can be done in from fifteen to eighteen minutes. He thinks the death reported by Dr. Gibbon was due to shock or to an embolus in the brain. Shock is now recognized as the cause of deaths which occur during irrigation. The writer knows of no deaths from chloroform, but has heard of one resulting from struggles during etherization. The straight incision is undoubtedly the best. If it is carried below the seventh rib, the diaphragm is apt to be injured, but the finger can be carried down much farther. Dr. Brinkman has seen one case where the patient wore a silver tube in his side for fifteen years. Removal of the tube was followed in a week by healing of the cavity.

THE TREATMENT OF EXOPHTHALMIC GOITRE.

DR. JOHN B. DEEVER read a paper on this subject, reporting a case of bilateral removal of the entire cervical sympathetic, *i.e.*, the cords and their ganglia, for which see July ANNALS OF SURGERY.

MYOSITIS OSSIFICANS TRAUMATICA.

DR. WILLIAM J. TAYLOR read a paper with the above title, for which see page 825.

DR. JAMES K. YOUNG reported a case of myositis ossificans that occurred in a man aged fifty. The rectus of the quadriceps

extensor was the muscle involved, the exciting cause being the kick of a horse. The resulting mass was two and one-half inches wide and one inch thick. It was movable and very dense.

DR. WILLIAM J. TAYLOR said he wished to modify slightly the statement in his paper that the patient had had no trouble since. One year after the operation, a horse ridden by the man fell, and threw him in such a way that a root ran into the old operation scar. This was followed for a time by the discharge of inflammatory material and dark-colored blood, but the wound afterwards healed entirely and has given no trouble since.

DR. W. M. L. COPLIN, who had reported the histological findings in the tissue removed by Dr. Taylor, spoke of the difficulty experienced by pathologists in making diagnoses from very small fragments of tissue, as in the case under discussion. The tissue in question contained masses of marrow cells in a cellular matrix, altogether resembling the cell picture of myeloid sarcoma. The suspicion of myositis ossificans was first aroused by finding newly-formed bone along the degenerating muscle-bundles. Ossifying myositis has been classified as idiomatic or traumatic, and disseminated or local. Regarding the origin of the condition, there is some question as to its inflammatory nature. It is held by some writers to be a dystrophy, thus belonging to the group of diseases including pseudohypertrophic muscular paralysis. This view, however, is not generally accepted. The fact that traumatism is frequently a cause, the presence of lymphoid infiltration and the formation of new fibrous tissue point to the inflammatory nature of the process. It has been thought that it might depend upon the presence of congenital or acquired ectopia of osteogenetic tissue which is stimulated to growth by irritation; the view that the bony change originates in a congenital defect in the involved parts is an adaptation of this theory. Regarding the condition as one that is essentially inflammatory in nature, places it in close relation to the ossifying inflammations of tendon sheaths and glands. Still another view is that myositis ossificans is essentially neoplastic in nature, and thus comparable to cases of multiple osteomata in the lungs, glands, etc. The many suggestions offered prove that the origin of the change is yet unknown. That it is infectious in character has even been suggested. In a reported case of gonorrhœal myositis and in a case of staphylococcus infection, similar but not identical changes have been recorded. It is not uncommon

to find near tuberculous foci osteoid or chondroid or, perhaps better, cretaceous areas that may resemble bone. In closing, Dr. Coplin emphasized the possible difficulty in differentiating ossifying myositis from myeloid sarcoma, especially in tissue from the region of the jaw. This difficulty is particularly marked when the specimen consists of only fragments of tissue.

CAPTAIN CHARLES F. KEIFFER, U. S. A., stated that he had excised a bony fragment from the deltoid muscle of a cavalryman who had first noticed the condition ten years before. The fragment was true bone and had reached the size of a half-dollar. In looking up the literature, he had found that in the times of Gustavus Adolphus and Frederick the Great the soldiers were troubled with what they called sesamoid bones in the deltoid muscles. Their formation was attributed to the irritation and pressure of the guns carried by the soldiers. This cause was probably active in the case of the cavalryman, whose gun was slung in such a manner as to jog against the deltoid.

DR. WILLIAM G. SPILLER, who made a histologic study of the tissue removed by Dr. Keen, said that the large size of the nerve, of which a piece had been removed, was owing to connective-tissue proliferation. The removal of the segment may have been of advantage, as benefit has at times followed a similar operation, inasmuch as the ends brought together contain more nearly normal nerve tissue than the portion removed.

TRANSACTIONS

OF THE

CHICAGO SURGICAL SOCIETY.

Stated Meeting, March 2, 1903.

MALCOLM L. HARRIS, M.D., in the Chair.

REMOVAL OF BIRTH-MARKS.

DR. L. L. McARTHUR presented a young woman whom he had recently subjected to a new procedure for the obliteration of an extensive superficial vascular nævus of the forehead, eyelid, and cheek.

The red color of these marks being due to capillary dilatation, it was necessary to obliterate the capillaries. In order to do this, he conceived the idea that if on a plane horizontal to the surface upon which this red area rested a section was made of the integument in such a way that the entire thickness of the integument should not be destroyed, but that the knife should pass through each capillary loop as it came to the surface, he would then still have integument enough intact to prevent actual perforation of the same, with protection of the connective tissue beneath. If, after waiting for coagulation of the blood in these cut capillaries, a thin Thiersch graft should be applied, all of these cut capillaries would then be obliterated, being plugged with blood-clot, and the graft, becoming organized, would destroy the pigmented appearance of such a mark.

Eighteen months ago the young woman presented herself with a very pronounced mark that extended over forehead from the scalp to the eyebrow, including the eyebrow, the upper eyelid, and a portion of the malar prominence of the cheek. He adopted the method of procedure described on a surface which had already received electrolysis and various other methods for the destruction of the vessels and color without avail, and he had succeeded so

well that he thought it worth while to exhibit the result. The scar was so soft there was a flexible eyelid. Before this treatment, the mark could be seen readily across the room, but now one had to look before noticing it.

LATE RESULT OF PYLORECTOMY FOR CARCINOMA.

DR. MCARTHUR again presented a case previously exhibited to the Society. The patient was a man from whom he had removed a portion of the lesser curvature of the stomach and the anterior wall, with also a portion of the inferior surface of the left lobe of the liver, for carcinoma. He presented at that time the microscopic slides. Those slides were examined by several of the Fellows present, and pronounced, notably by Dr. Fenger, to be undoubtedly carcinomatous, as the tissue could be seen involving the liver tissue without any capsular line of demarcation between the normal liver tissue and the new growth. He presented the case first to the Society because it was a recovery from a resection of the liver and stomach wall combined, accompanied with the report furnished by the Pathological Laboratory at St. Luke's declaring it to be an adenocarcinoma. At that meeting the opinion was expressed that the man would in all probability soon succumb to a rapidly recurring carcinoma. He had not been convinced, as he recalled the cut surface of the liver from which the growth was excised. He knew that he had removed all of the stomach growth. He felt sure of it. Nevertheless, he felt rather timid as to the probability of the man living. Not only was the patient living, but was continuing to do the work he had done for years at St. Luke's Hospital, he being one of the employes there. The patient had increased in weight from 117 pounds at that time to 135 at present.

APONEUROTIC SUTURE FOR FRACTURE OF THE PATELLA.

DR. DANIEL N. EISENDRATH presented a man who had come under his care at the Cook County Hospital with a fracture of the patella. Having opened the joint for the purpose of drilling and suturing the fragments together, at the last moment he found the drill would not work; it was impossible to penetrate the bone with the drill on account of a screw in the drill having been lost, so he was compelled to suture the aponeurosis. He found the aponeurosis had been turned in at the edges of the fracture, and

the fascia, periosteum, and aponeurosis were turned in in a typical manner between the edges of the fracture. He pulled them out, brought the fractured ends closely together, and inserted four sutures of kangaroo tendon through the aponeurosis on both sides of the patella, and two sutures through the periosteum of the patella itself. The accident to the patient occurred on the 12th of November, 1902. After the operation the limb was immobilized by a plaster-of-Paris bandage. He operated the day following the injury. The incision was made transversely over the fracture. No opportunity was lost to resort to passive exercise and massage to recover function of the joint as well as possible. Six weeks after fracture, an X-ray picture showed absolutely no separation of the fragments. He exhibited the patient not only on account of the anatomical, but to show the functional result, which was perfect within seven or eight weeks after the fracture.

SURGERY OF THE KIDNEY.

DR. D. S. FAIRCHILD, of Clinton, Iowa, read a paper in which he presented some observations,—

First, in relation to trauma of the kidney not involving open wounds or wounds that have healed;

Second, in relation to suppurative nephritis;

Third, in relation to chronic degenerative disease of the kidneys.

He said that a considerable number of cases of injury to the kidney with hæmaturia had come under his observation which were not attended with open wounds or with symptoms of such severity as to require an immediate or early operation. Two of these cases he thought were entitled to special consideration. In these two cases the chief symptoms were persistent recurrent hæmorrhage and pain in the back. In one case the patient fell with his body in a doubled-up position, there was very little shock, and the hæmorrhage was never severe, but was persistently recurring on exercise. There was also a moderate amount of pus in the urine. After three months, no improvement appearing, the right kidney was explored and an irregular calculus of the size of a pigeon-egg found in the pelvis. The stone was removed, and the patient, a conductor, resumed his employment, and had continued well up to the present time. A calculus was expected on account of the pain in the region of his kidney and occasionally

in the bladder together with the pus, without definite evidence of cystitis. The calculus is believed to have existed prior to the injury and was the cause of the hæmorrhage.

In the second case the side-rod of a locomotive engine broke, came up through the cab and struck the engineer in the back in the region of the right kidney. There was some shock. Hæmorrhage appeared the next day and continued in moderate quantity for two weeks, then it became intermittent and occurred chiefly after exercise. The man became neurasthenic and lost ten pounds in weight. Six months after the accident no material improvement had occurred. There was no pus in the urine and no rise of temperature. The speaker could not determine the nature of the lesion beyond the probability of a laceration of the kidney substance which had not healed, and opened up from time to time on exertion. The long continuance of the hæmorrhage without improvement appeared to him to entitle the case to surgical interference; but on account of a dispute between the patient and the railway company as to the question of liability and damages, no proposition of a surgical character was entertained. Absolute rest for three months resulted in an almost complete disappearance of the hæmaturia. At the end of a year the hæmorrhage entirely disappeared. The latest information is to the effect that the man is suffering from a "railway spine" or traumatic neurasthenia.

He spoke next of the cases which at first present but few symptoms of serious lesion beyond the primary shock. He had observed that the degree of shock is often greatly in excess of the damage to the kidney itself. Recently he had seen a policeman who had been shot, the ball entering between the ribs on the left side and passing through the upper part of the left kidney and lodging in the left lumbar muscles. The shock was very profound for three hours, when reaction occurred; blood passed with his urine for two days, and recovery was uninterrupted.

The nature of the injury and the absence of secondary evidence of serious kidney or other damage may warrant the surgeon in withholding operative interference until further indications arise, but to assume that because the patient presents favorable symptoms on the days immediately following the reaction from the primary shock, or if no serious shock has occurred, is not entirely safe. It is true that the great majority recover, but it

sometimes happens that complications develop. If suppuration or anuria occurs, the same indications present themselves as in cases without a history of injury, and the urgency for operative treatment will be the same.

The presence of a tumor in the region of the kidney appearing after an injury is significant of some secondary involvement either of the kidney itself or the perinephritic tissue. If the disease has its origin in the kidney, it will usually be recognized by the presence of pus in the urine; but in some cases the ureter may become obstructed and the pus disappear early, leaving an uncertain and somewhat obscure history for the surgeon to base a diagnosis on; or pus may never be discovered in the urine at all on account of an early blocking of the ureter. The tumor may arise from a perinephritic hæmorrhage or an injury to the surrounding tissue with subsequent infection and suppuration. The rise of temperature and other evidence of pus formation will be of great diagnostic value in determining these conditions. The formation of aneurism of the renal artery or its branches will in a certain proportion of cases appear early, but it often appears late. There are no distinctive symptoms of this condition, and it is usually only diagnosed at the time of operation or on post-mortem examination. A tumor in the region of the kidney was found in fourteen of the nineteen cases collected by Morris, but there is nothing in the appearance of a tumor to indicate the nature of the disease. It can be distinguished from a suppuration by the absence of pus in the urine and by the absence of fever. If there is a clear history of the injury, by a careful analysis of the foregoing observation a diagnosis may be made. This is undoubtedly one of the most serious pathological lesions, and the one most liable to be overlooked in cases where pain is not present. If, however, the profession would recognize the fact that persistent kidney symptoms—especially those attended with a tumor formation, and if there is a history of an injury—are surgical affections, and treat them by operative methods, an incomplete diagnosis would not be a serious fact, for then the right thing could be done if in the hands of skilful operators.

Diffuse suppurative nephritis of the more chronic interstitial forms are not infrequently overlooked. In one case which came under his observation the condition was not discovered until the

man was examined for life insurance. He was not engaged in any active employment and no definite symptoms were complained of. In a second case a woman had been operated on for a myoma of the uterus. Ten days after the myomectomy was made the patient was taken with a chill, which was followed by a temperature of 104° F. In seeking for the cause of this complication, a microscopical examination of the urine was made and pus was discovered. A further examination revealed a swollen and tender right kidney. The temperature varied from 102° to 104° F. In two weeks the temperature subsided, and for a week the patient rapidly improved, when another chill developed, followed by a temperature of 104° F. The urine rapidly decreased in quantity, and in two days anuria developed, attended with delirium of a uræmic character. The kidney was then exposed by lumbar incision and incised freely from end to end, exposing the pelvis. The organ bled freely, no abscess was found, and no pus was apparent to the naked eye. The wound in the kidney was left open and the wound in the loin loosely packed with gauze. The patient remained in a semicomatose condition the remainder of the day; the next morning the dressings were found saturated with urine and eight ounces were passed from the bladder, from the apparently normal kidney. Temperature 100° F., and the patient much improved in mind. The amount of urine steadily increased until the normal amount was reached. From the time the first urine was passed from the bladder after the operation, no pus was found. A moderate amount of pus was found in the urine saturating the dressings. The temperature soon became normal; the wound healed slowly. She was kept in the hospital after the wound closed, and when sent home the urine was free from pus. She is now in good health. The nature of the lesion in the kidney was an interstitial nephritis. Observations of the character above referred to indicate that injuries to the kidney may be followed by secondary infection, as a later development or a primary infection without an injury may be associated with interstitial changes which may lead to a train of symptoms which may for some time escape discovery. When, finally, the diagnosis is made, operative treatment is the most certain in result. If the disease can be located in one kidney, either by physical examination or by the segregator, the kidney should be exposed and drained by incision. If both kidneys are involved, the same course

may be adopted, allowing a sufficient interval to elapse between each operation to permit the operated kidney to recover. The results where both kidneys are diseased will not be as good as in the single diseased kidney, but will certainly be better than medical treatment alone.

DR. ARTHUR DEAN BEVAN said that about six weeks ago, in Dr. Robison's service at the Presbyterian Hospital, a man presented himself with an enormous hydronephrosis of the left side. The patient was observed for some days, and then transferred to the surgical side. On examination, he found a tumor occupying the entire left half of the abdominal cavity, with the descending colon distinctly in front of the tumor, as outlined by a distinct, sausage-shaped tympanitic mass in front of the tumor. The man was passing a small amount of urine, was sweating profusely, and the quantity of urine passed from the bladder never exceeded 800 cubic centimetres in twenty-four hours in the few days while he was under observation. Under nitrous oxide gas he made a nephrotomy, opened a large hydronephrotic sac, and allowed a gallon of fluid to escape. The fluid was clear and did not contain any pus to the gross appearance. Most of the fluid escaped immediately after making the incision, as it was under considerable tension. After the operation the man passed about two ounces of urine in six hours; then there was dribbling of urine for twelve or eighteen hours afterwards, and another dribbling about twenty-four hours afterwards from the urethra. After that he did not pass a single drop of urine from the bladder. In the wet dressings from fifty to sixty ounces of fluid were found daily. The patient was watched for a number of weeks; his general condition improved so as to warrant making a radical operation, and under chloroform (second operation) Dr. Bevan exposed the hydronephrotic sac. After exposing the hydronephrotic sac, he found the ureter running along it, adherent to it, hooked over a small additional renal artery, and descending from this artery downward, there being quite a sharp flexure at the point where the additional renal artery held the ureter up. The renal artery was divided between two ligatures, and the flexure of the ureter relieved.

On opening into this hydronephrotic sac through a two-inch incision, and by turning it inside out with the finger, he found the ureter was no longer patulous. Then by means of a Heinicke-

Mikulicz operation, like a pyloroplasty, the opening between the ureter and the pelvis was enlarged. An opening was made by dividing the ureter and pelvis for three-quarters of an inch longitudinally, and uniting them by stitches. He did not hesitate to use fine silk stitches, because there was a large drainage opening, which would have to be maintained for some time, and they—the stitches—could be washed out through the large tube which was used.

The position of the renal artery was probably the cause of the hydronephrosis. The man had only one functioning kidney. He called attention to the fact that Fenger first did this operation in 1892, and was followed by four or five other operators. There were now half a dozen of these cases on record. He was convinced of the desirability of making the plastic from within rather than from without, as advocated by Fenger. He thought it was a comparatively easy procedure to make a plastic on the ureter by invaginating a part of the sac and bringing the ureter out through the opening, so that one could readily incise both ureter and sac from within, and apply stitches from within. In the Fenger operation, the entire operation was done from without, and, as in a Heinicke-Mikulicz, the stitches were applied externally.

DR. L. L. McARTHUR commented upon the case referred to by the essayist, in which all the symptoms pointed to a suppurative process in the kidney, with profound constitutional reaction, with a temperature of $103-4^{\circ}$ F., with pus found even with the segregator as coming from a definite kidney, and yet incising the kidney, but finding no pus present macroscopically observable, still to have the temperature drop, the patient improve, and all the alarming symptoms disappear, was gratifying and almost inexplicable, unless one considered these cases to belong to the group which had been classified as the interstitial mycoses of the kidney. In these there was really not a suppurative process in the kidney, but a bacterial process involving the substance proper of the kidney, as seen sometimes in the microscopic sections presented by pathologists, with the bacteria stained in the substance proper of the kidney, the process being relieved by splitting of the capsule and free drainage of the kidney. Such an experience he had recently had in a case of colon bacillus infection of the right kidney, in which a pure culture was found, in which the tempera-

ture was so high (106° F.) and the chills so severe as to warrant surgical interference for the relief of the patient, who was suffering not only from toxæmia, but from intense nephralgia. He was extremely chagrined to find no pocket of pus in the pelvis of the kidney, yet his patient improved, as did the patient of the essayist, from simple section and opening of the pelvis of the kidney, with no stone found, no collection of fluid in the kidney, the kidney engorged to more than 50 per cent. of its own normal volume.

In regard to the making of an opening in the orifice of the ureter, which has a kinking at its entrance to the kidney, or a valvular implantation, he reminded Dr. Bevan that in all of these cases of hydronephrotic or sacculated kidneys such a section could be made and the portion at fault turned into view. He had had two such cases which he had relieved, but which were not ones that had been treated by the method described by Dr. Bevan. One was a case of intermittent hydronephrosis which, at the time of operation, was entirely empty, yet showed an oblique implantation of the ureter and needed a Heinicke-Mikulicz operation for its correction. The other was a case of suppurative pyelonephrosis, with high temperature. In this case the indication was to drain the suppurating kidney and allow the toxic element in the case to subside, and later correct the process after the septic elements had been removed. In this case the kidney had again resumed its normal size and function. Urine came out at the side instead of down through the ureter. Operative intervention was necessary in this case, which could not have been done from within.

He objected to the use of a silk suture within any urinary tract, because he had had the painful experience of having had to remove a calculus which had formed around the knot of the silk which he had introduced into a suprapubic incision of bladder. Calcareous matter had deposited on that portion of the loop which finally required operative intervention. Those who have done much work on the kidney must certainly have noted the rapid deposit of phosphatic or uric acid crystals on such nuclei. In some cases, at the end of twenty-four, forty-eight, or seventy-two hours, and being situated in the ureter, they were more apt to float down the ureter or be carried down by the peristaltic wave

into it and cause trouble, than be washed out through the drainage tube.

DR. DANIEL N. EISENDRATH reported the case of a boy who fell down a flight of steps and immediately afterwards had severe hæmaturia, which lasted for three days. He did not see the boy until two weeks later, when he complained of a dragging sensation in the right side of the abdomen, where the floating kidney could be felt. In consultation with Dr. E. W. Andrews he cut down upon the kidney, and found it was displaced below the pole. The hilus of the kidney was about the level of the umbilicus, and the kidney was anchored in place; but the boy developed traumatic neurasthenia, and passed from under his observation. Here was a distinct traumatic displacement of the kidney. One could see hæmorrhages into the perirenal tissue at the time of the operation.

Another thing which the essayist called attention to, which was exceedingly important, was the relation of an injury at some long antecedent date to the development of interstitial nephritis. He recalled one case which he had had under observation, of a man who gave a history that when a child of twelve years of age he had fallen and had suffered from hæmaturia. Patient was now thirty-eight years of age. At the time he saw him he had marked interstitial nephritis, with all of the characteristic clinical symptoms of that disease.

A blood-clot, he thought, was frequently the starting-point of a calculus.

In cases of injuries of the kidneys, it was difficult to decide what to do at the time the patient was first seen; whether to wait, in extraperitoneal rupture, to see if hæmaturia continued the first day or so, provided one had not made a diagnosis, for example, of rupture into the peritoneal cavity, which latter would demand immediate operation.

THE DROWNING OF PATIENTS IN FÆCAL VOMIT DURING OPERATIONS FOR INTESTINAL OBSTRUCTION AND SEPTIC PERITONITIS.

DR. E. WYLLYS ANDREWS read a paper with the above title, for which see page 862.

PHARYNGOLARYNGECTOMY.

DR. A. E. HALSTEAD exhibited a specimen of larynx, pharynx, and tonsil which he removed last April from a man at the Chicago Polyclinic Hospital. The patient was forty-five years of age. The carcinoma started from the larynx just above the vocal cords, and involved the epiglottis, pharynx, and tonsil. The first operation was a preliminary tracheotomy, which was done because of the dyspnoea from which the patient was suffering. This preliminary tracheotomy, however, was not performed by himself. It was three weeks later before the radical operation was done. The trachea was plugged by the Trendelenburg balloon cannula, and as soon as the trachea was cut through, the cannula was removed, and an ordinary tracheotomy tube inserted. The anæsthetic was given through this, the previous tracheotomy opening having been plugged. The larynx was completely separated, together with the anterior wall of the œsophagus, the side of the pharynx, the tonsil, half of the hyoid bone, and epiglottis. A plastic operation was performed on the anterior wall of the trachea, and the wound closed. A stomach-tube was introduced, and fastened at the upper angle of the wound. The second day after operation the patient became delirious, tore out the stomach-tube, and opened up the wound. He made a very fair recovery from the operation, was up and around at the end of a week, and lived for eight months. He died from pneumonia, which was caused by exposure. After the operation, the patient became somewhat demented, frequently left the bed and wandered around at night without any clothing on him. There was no local recurrence, nor metastases found at the autopsy.

ABSCESS OF STENSON'S DUCT, WITH PLASTIC OPERATION.

DR. DANIEL N. EISENDRATH reported the case of a young woman who was referred to him by Dr. E. J. Kuh, with a diagnosis of a salivary calculus. There was a hard mass to be felt at the middle of the cheek. The first time he operated he made an incision opposite the opening of Stenson's duct within the mouth, tamponed it, and kept it in for two weeks, in the hope that healing would take place by granulation, or else he would get a new opening. At this operation he evacuated a teaspoonful of pus from what he thought at the time was a dilated Stenson's duct.

He allowed the young lady to go home, and the after-treatment was practically the same. Gauze was packed in the opening from time to time; but soon after returning to her home, the duct began to enlarge again, the inflammation returned, and she came back to him with a much larger swelling than she had before. He decided that possibly the best thing was not to go through the mouth at the origin of the opening (second upper molar tooth), but to open from the outside. He made an incision parallel to Stenson's duct, cut down upon the duct, and found it was dilated for a distance of about an inch and a half away from the parotid gland, and the opening in the mouth was completely occluded. There was a mass of pus, and the edges of the duct and its walls were gangrenous. He thought it was useless to try and drain it externally, on account of having a salivary fistula. He made an incision through which he followed up the duct to the entrance into the parotid gland, and after dissecting out about an inch and a half of it, and pressing out the secretion from the gland, which was of a yellowish character, as though pus had travelled back into the gland itself, he made a slit in the masseter muscle and pushed the duct through it at right angles to the mouth. In other words, he did a plastic operation on the duct itself, which now opened at a distance three-quarters of an inch posterior to the normal opening. He had fully expected the operation to be followed by failure, *i.e.*, salivary fistula, but he was surprised that the patient did not have one. It was now three months since the operation was performed. The wound healed in two weeks after operation.

INDEX TO VOLUME XXXVII.

A

ABBE, ROBERT, Subdural interposition of rubber tissue in operations for tic douloureux, 1.

ABBOTT, FRANCIS CHARLES, Neurofibromatosis of tongue, 321.

Abdomen, Pistol-shot wound of the, 284; and thorax, Gunshot wound of; Recovery, 437.

Abdominal cavity, Pin in the, 949; contusions, Diagnosis and treatment of, 107; Associated with visceral injuries, 197; Diagnosis of intestinal injury following, 525, 623.

Actinomycosis, 463; Report of sixty cases of, 336.

Adénolipomatose symétrique, 932.

Aged, Injuries from falls upon the buttocks in the, 388.

ALLIS, OSCAR H., Treatment of gall-stones impacted in the common duct, 115; Results of falls upon the buttocks in the aged, 388.

Anæsthesia by scopalamine and morphine, 149.

Anæsthetics in operations for typhoid perforations, 287.

Anatomy, Cunningham's Text-Book of, Review of, 633; Rockwell's Pocket Text-Book of, Review of, 796.

ANDREWS, E. WYLLYS, Omental grafts, 630; Drowning of patients in fæcal vomit during operations, 862.

Aneurism, Cure of, by arteriorrhaphy, 161.

Aneurisms of bone, Pathology of, 834.

Angioma of the neck, Cavernous, 285.

Antrum, maxillary, Distention of, 947.

Anuria, Surgical treatment of, 575, 626.

Anus, Artificial, for relief of chronic ulceration of lower bowel, 445.

Appendicitis followed by suppurative pylephlebitis, 471; followed by left-sided subphrenic abscess, 472.

Appendicostomy for chronic colitis, 781.

Appendix, Gangrene of, with diffuse peritonitis; recovery, 431; Removal of, followed by acute yellow atrophy of the liver, 362; Tack in the, 950; Use of, to flush the colon, 613; vermiform, Primary carcinoma of the, 549, 891.

Arterial anastomosis, End-to-end, for gunshot injury, 719.

Arteries, Ligation of, 42.

Arteriorrhaphy for the cure of aneurism, 161.

Aspirating trocar, 769.

Astragalus, Removal of, for relief of talipes calcaneus, 107.

ATHERTON, ALFRED BENNISON, Retroperitoneal hernia, 883.

Axilla, Sarcoma of, 101.

B

BAIN, JOHN BAXTER, Blank-cartridge wound infected with tetanus bacilli; Excision; no Tetanus, 399.

BALDWIN, JAMES FAIRCHILD, Knife-blade removed from lung, 360.

- BALLIN, MAX, Acute yellow atrophy of the liver as a sequel to appendectomy, 362.
- BARACZ, R. VON, Report of sixty cases of actinomycosis, 336; Value of nitrate of silver in the treatment of actinomycosis, 468.
- BARNETT, CHARLES E., Possible cause of difficulty in the differential diagnosis of renal and hepatic calculi, 36.
- Basedow's disease, Considerations relative to, 9.
- BELFIELD, WILLIAM T., Actinomycosis, 463.
- BERG, ALBERT ASHTON, Urethroplasty, 486.
- BEVAN, ARTHUR DEAN, Anuria after nephrectomy for cystine calculus, 294; Dislocation of individual carpal bones, 296; Perforation of Meckel's diverticulum as a cause of peritonitis, 297; Carcinoma of the larynx, 463; Treatment of actinomycosis, 465; Subphrenic abscess, 473; Surgical treatment of anuria, 575, 628; Omental grafts, 631; Carcinoma of the larynx, 632; Hydronephrosis, 967.
- Birth-marks, Removal of, 961.
- Bladder, Extraperitoneal rupture of the, 98; exstrophy of, Rectovesical anastomosis for, 290; Intraperitoneal rupture of, 215, 438, 886; Sacculated, 470; Suction apparatus for continuous drainage of, 886.
- BLAKE, JOSEPH A., Tuberculosis of intestine, 106; Abdominal contusions, 108; Ulcer of stomach, with hour-glass contraction, 280; Perforating typhoidal ulcer, 283, 287; Gunshot wound of abdomen and thorax; Recovery, 437; Perforating ulcer of stomach, 929; Diffuse peritonitis, 932; Rupture of internal meniscus of knee, 934; Typhoidal perforation of the gall-bladder, 935.
- BOLTON, PERCY R., Intraperitoneal rupture of the bladder, 438.
- Bone aneurisms, so-called, Pathology of, 834.
- Bone-drill, Hollow, 454; Twist, 455.
- Bottini operation for prostatic hypertrophy, 622.
- BOUFFLEUR, A. I., Stricture of the œsophagus, 791.
- Brain, Bullet in, 946; cortex, Sclerosis of, 274; Fibroma and cyst of, 276; operations, Elevator for, 461; Protector from Gigli saw, 505; Tumor, 610.
- Branchial fistula, 56.
- Breast, Primary tuberculosis of, 510; recurrent carcinoma of, Excision of costal cartilage and parietal pleura for, 775.
- BREWER, GEORGE E., Thyroglossal dermoid, 96; Rupture of the kidney, 97; Extraperitoneal rupture of the bladder, 98; Diagnosis and treatment of abdominal contusions associated with visceral injuries, 197.
- BRINKMAN, LEON, Drainage of the chest in empyema without tubes, 952.
- Bronchotomy, Intramediastinal, 299.
- BROWN, F. TILDEN, Cases of typhoid perforation, 287; Closure by suture of intestinal perforations complicating typhoid fever, 380; Gastro-enterostomy, 941; Gangrenous pancreatitis, 942; Hæmorrhage from bullet-wound of renal vessels, 948.
- Bursæ, tuber ischii, Hygroma and fibroma of, 393.
- Buttocks, Falls upon the, in the aged, 388.
- Byford's Manual of Gynæcology, Review of, 314.

C

- Cæcum, Excision of the, 785.
 Carbuncle, 471.
 Carotids, Ligation of both common, for intracranial arterio-venous aneurism, 443.
 Carpal bones, Dislocation of individual, 296, 402.
 Cathelin urine divisor, Test as to efficiency of, 799.
 Chest wall, enchondroma of, involving diaphragm, Successful removal of, 724.
 CHICAGO SURGICAL SOCIETY, Transactions of the, 290, 463, 785, 961.
 Cholecystectomy, 602, 774, 779.
 Cholecystitis, Gangrenous, 115.
 Choledochoduodenostomy, 779.
 Choledochotomy, 779.
 Clavicle, Excision of the, 79.
 Club-foot in adult, Operative cure of, 430.
 Cocaine, Intraperitoneal injections of, during amputation of leg, 116.
 COLEY, WILLIAM B., Sarcoma of the femur, 100; Sarcoma of axilla, 101; Results of one thousand operations for the radical cure of hernia, 801.
 Colitis, Amœbic, treated by flushing through the appendix, 613.
 COLLINS, HOWARD D., Intracranial neurectomy, 665.
 Colon, Extirpation of entire, for hyperplastic colitis, 616.
 CONNELL, KARL, Suction apparatus for continuous drainage of bladder, 886.
 COOK, ANSEL G., Orbital route for removal of second branch of fifth nerve at foramen rotundum, 855.
 COPLIN, W. M. L., Histology of ossifying myositis, 959.
 Coville, Work-Book in Surgery, Review of, 160.
 Coxa vara, Bilateral, 274.
 CRILE, GEORGE W., Tubage of the pharynx in certain operations on mouth and face, 859; Hot-water bed for operating table, 860.
 Crucial ligaments, Suture of ruptured, 716.
 CUMSTON, CHARLES GREENE, Case of pancreatic cyst, with remarks on pathology and surgical treatment, 226; Hepatic syphilis from a surgical stand-point, 726.
 Cunningham's Text-Book of Anatomy, Review of, 633.
 CURTIS, B. FARQUHAR, Gunshot wound of the longitudinal sinus, 848; Bullet in brain, 946.
 CUSHING, HARVEY, Treatment of facial paralysis by nerve anastomosis, 641.
 Cystine calculus of kidney, 294.

D

- DA COSTA, J. CHALMERS, Extradural hæmorrhage, 451; Marjolin's ulcer, 496.
 DAVIS, GWILYM G., Marjolin's ulcer, 451; Extradural hæmorrhage, 454; Abdominal contusions, 624.
 DAVIS, THOMAS A., Anuria, 628.
 DAWBARN, ROBERT H. M., Points in ligation of arteries, 42; Flail-joint after excision of elbow, 95; Hallex valgus, 429; X-ray treatment of malignant tumors, 433; Cholecystectomy, 604; Treatment of wounds of sinuses of dura mater, 609; Appendix used for flushing the colon, 613.
 DELATOUR, HENRY B., Excision of the clavicle, 79.
 Diaphragm involved in enchondroma of chest wall, Operation for, 724.
 Dissection and Practical Anatomy, Eckley's Manual of, Review of, 640.
 DOUGLAS, RICHARD, Primary retroperitoneal solid tumors, 372.

DOWD, CHARLES N., Pylorectomy for carcinoma, 270; Persistent thyroglossal duct, 271; X-ray treatment of malignant tumors, 433; Tuberculosis of femoral, inguinal, and iliac lymph nodes secondary to foot wounds, 746, 782.

Drainage of bladder, Suction apparatus for continuous, 886.

DUNHAM, THEODORE, New instruments for treating stricture of the œsophagus, 350.

E

Eckley's Manual of Dissection and Practical Anatomy, Review of, 640.

EISENDRATH, DANIEL N., Left-sided subphrenic abscess after appendicitis, 472; Omental grafts, 631; Aponeurotic suture for fracture of the patella, 962; Surgery of the kidneys, 970; Abscess of Stenson's duct, 971.

Elbow-joint, Excision followed by flail-joint, 95.

ELIOT, JR., ELLSWORTH, Treatment of abdominal contusions, 109; Pistol-shot wound of the abdomen, 284; Cavernous angioma of the neck, 284; 285; Excision of costal cartilage and parietal pleura for recurrent carcinoma of the breast, 775.

ELTING, ARTHUR W., Primary carcinoma of the vermiform appendix, 549.

Empyema of chest, Drainage without tubes, 952.

ERDMANN, JOHN F., Thyroglossal dermoid, 97; Abscess of liver of traumatic origin, 272; Loose cartilage in knee, 606; Laceration of superior longitudinal sinus, 607; Primary typhoidal perforation of the gall-bladder, 878, 935;

Perforating ulcer of stomach, 928; Adénolipomatose symétrique, 932.

Exstrophy of the bladder, Rectovesical anastomosis for, 290.

Extradural hæmorrhage from rupture of middle meningeal artery, 341.

F

Face, Mouth, and Jaws, Diseases of, Text-Book by Horace Grant, Review of, 158.

Facial paralysis, Treatment by nerve anastomosis, 641; Possibility of operative relief of certain forms, 660.

Fæcal vomit, Drowning of patients in, 862.

FAIRCHILD, D. S., Anuria, 626; Surgery of the kidney, 963.

Femur, Sarcoma of, 100; Recovery by injection of mixed toxins, 435.

FENNER, ERASMUS DARWIN, Apparatus to facilitate application of plaster jackets during spinal hyperextension, 92.

Fenwick on Cancer and other Tumors of the Stomach, Review of, 794.

FERGUSON, ALEXANDER HUGH, End-to-end anastomosis of popliteal artery for gunshot injury, 719.

Fibroma of ovary, 468; of uterus, 470.

Fifth nerve, Removal of second branch of, at the foramen rotundum through the orbit, 855.

FISK, ARTHUR L., Excision of tongue for sarcoma, 273.

Foot wounds followed by tuberculosis of femoral, inguinal, and iliac lymph nodes, 746, 782.

Forearm, Gunshot wound of, 458.

Fractures and Dislocations, Review of Helferich's Atlas and Epitome of, 158; The Treatment of, Review of Scudder on, 159; Ununited, of leg, 439.

FRANK, JACOB, Exstrophy of the bladder, 292; Excision of the cæcum, 785.

FRAZIER, CHARLES H., Elevator for operations upon base of brain, 461.

FRIEND, EMANUEL, Hygroma and fibroma of the tuber ischii bursæ, 393.

G

GALLAUDET, BERN B., Tumor of brain, 279.

Gall-bladder operations, 602; Primary typhoidal perforation of, 878, 935.

Gall-stones impacted in the common duct, Operative treatment of, 113.

Gastro-enterostomy for benign stenosis of pylorus, 940.

Gastrostomy and gradual dilatation for stricture of œsophagus, 785.

GAYLORD, HARVEY R., Pathology of so-called bone aneurisms, 834.

Genital organs, male, Tuberculosis of, 152.

Genito-Urinary and Venereal Diseases, Review of Schmidt on, 633.

GIBBON, JOHN H., Gangrenous cholecystitis, 115; Amputation of leg during intraneural cocaine anæsthesia, 116; Abdominal contusions, 623; Drainage in empyema of the chest, 956.

GIBSON, CHARLES L., Cholecystectomy and choledochotomy, 779; Choledochoduodenostomy, 779; Intestinal obstruction by band, 781.

Goitre, exophthalmic, Surgical treatment of, 9, 958.

Gonorrhœal peritonitis, 619.

Graham's Treatise on Massage, Review of, 639.

GRAHAM, D. W., Fibroma of the ovary, 468; Uterine fibroma, 470; Sacculated bladder, 470; Appendicitis followed by suppurative pyelophlebitis, 471; Carbuncle, 471.

Grant, Text-Book of Diseases of Face, Mouth, and Jaws, 158.

GREENSFELDER, DR., Subphrenic abscess after appendicitis, 473.

Grindon on Diseases of the Skin, Review of, 478.

Gynæcology, Byford's Manual of, Review of, 314.

H

HALL, J. BASIL, Splenopexy for wandering spleen, 481.

HALL, J. N., Dislocation of hip in acute rheumatism, 503.

Hallux valgus, 429.

HALSTEAD, A. E., Exstrophy of the bladder, 293.

HAMMOND, LEVI JAY, Possibility of operative relief of certain forms of facial paralysis, 660.

HARRIS, MALCOLM, L., Treatment of actinomycosis, 466; Classification of anuria, 626.

HARTE, RICHARD H., Injuries at the hip in aged persons, 118; Drainage in empyema of the chest, 957.

HAWKES, FORBES, Immunity from recurrence after removal of gland, sarcoma of neck, 938; Bone cyst of superior maxilla, 939; Supernumerary thumb, 940; Needle and thread removed from under liver, 950.

Helferich, Traumatic Fractures and Dislocations, Review of, 158.

Hepatic duct stones, 539.

Hepatic syphilis, 726.

Hernia, congenital, Operation for, 151.

Hernia, Littré's, 936; Retroperitoneal, Moynihan on, Review of, 120; Retroperitoneal, 883; Results of one thousand operations for the radical cure of, 801.

HESSERT, WILLIAM, Dislocation of individual carpal bones, 402.

Hip, Congenital dislocation of the, 428; Dislocation in acute rheumatism, 503; Injuries in the aged, 118, 388.

Hip-joint amputation for tuberculosis, 456; Sarcoma of, 103.

Holt on The Diseases of Infancy and Childhood, Review of, 479.

HOPKINS, W. BARTON, Rupture of ligament patellæ, 460; A new osteoplastic trephine, 772; Excision of scapula for progressive myositis, 918.

HORSLEY, J. SHELTON, Post-typhoidal infection of ribs, 253.

HOTCHKISS, LUCIUS W., Cases of operation for typhoid perforation, 287; Congenital equinovarus, 430; Littré's hernia, 936.

Hot-water bed for operating table, 860.

Human Body, Review of McMurich's Manual of the Development of the, 315.

HUNTINGTON, THOMAS W., Considerations relative to Basedow's disease, 9.

I

Infancy and Childhood, Review of Holt on the Diseases of, 479.

Infantile spastic paralysis, Treatment of, 415.

International Clinics, Twelfth Series, Vol. iii., Review of, 636.

Intestinal injury following abdominal contusions, 525, 623; Obstruction by band, 781; obstruction by degenerated Meckel's diverticulum, 111; Perforations complicating typhoid fever, 380.

Intestine, Perforation of, traumatic, 447; Resection of, for strangulation by band, 946; Tuberculosis of, 106.

Intracranial neurectomy, 665.

Ischial, tuberosity, Hygroma and fibroma of bursæ over, 393.

J

JEPSON, WILLIAM, Anuria, 627.

JOHNSON, ALEXANDER B., Cholecystectomy, 602; Nephrectomy for tuberculosis, 605; Dislocated semilunar cartilage of the knee, 773; Cholecystectomy, 774; Tuberculosis of femoral lymph nodes, 782.

JOHNSON, HAROLD A., Results of decapsulation of the kidney, 592.

JONAS, A. F., Contribution to the literature of old irreducible dislocations of the shoulder-joint, 756.

JONES, DANIEL FISKE, Intraperitoneal rupture of the bladder, 215.

JONES, ROBERT, Treatment of infantile spastic paralysis, 415.

JOPSON, JOHN H., Extradural hæmorrhage from rupture of middle meningeal artery, 341; Control of extradural hæmorrhage, 452.

K

KAMMERER, FREDERICK, Treatment of abdominal contusions, 108; Hour-glass contraction of the stomach, 281; Anæsthetics in operations for typhoid perforations, 287; Hæmorrhage from spleen in typhoid fever, 288; Pylorectomy for carcinoma; no recurrence, 444; Artificial anus for relief of chronic ulcer of lower bowel, 445; Effects of removal of colon, 617; Perineal prostatesctomy, 622; Sarcoma of neck, 938; Gastro-enterostomy, 941.

KELLY, HOWARD A., Instruments for use through cylindrical rectal specula, 924.

Kidney, Cystine calculus of; Nephrectomy, 294; Gunshot wound of, 948; Removal of, for tuberculosis, 605; Results of decapsulation of the, 592; Surgery of the, 963; Rupture of, 97.

KIEFFER, CHARLES, Abdominal contusions, 625; Myositis ossificans, 960.

KILLIANI, OTTO G. T., Tumor of brain, 610.

Knee-joint, Dislocated semilunar cartilage of the, 773; Loose cartilage in, 606; Osteoma of the, 84; Rupture of internal meniscus of left, 934.

L

Larynx, Carcinoma of, 463, 632.

LE BOUTELLIER, W. G., Diffuse peritonitis from gangrene of appendix; Recovery, 431; Excision of patella in wound of knee, 945.

LE CONTE, ROBERT G., Treatment of gall-stones in the common duct, 113; Sequelæ to fracture of the neck of the femur in an aged person, 118; Diagnosis of intestinal injury following abdominal contusion, 525, 623.

LEWIS, BRANSFORD, Ureter-catheterism, 22.

Light, actinic rays of, Exclusion of, during operations for general peritonitis, 798.

LILIENTHAL, HOWARD, Sarcoma of rib cured by operation and injection of mixed toxins, 440; Pylorectomy, 442; Ligation of both common carotids for intracranial arteriovenous aneurism, 443; Gall-bladder operations, 603; Extirpation of entire colon, 616; Operations for prostatic obstruction, 622; Excision of ribs and parietal pleura, 777; Choledochoduodenostomy, 780; Tuberculosis of femoral lymph nodes after foot wounds, 783.

Liver, Abscess of, traumatic, 272; Acute yellow atrophy of the, as a sequel to appendicectomy, 362; Syphilis of, 726.

Longitudinal sinus, superior, Laceration of, 607; Gunshot wound of the, 848.

Lung, Knife-blade removed from, 360.

M

MCARTHUR, L. L., Exstrophy of the bladder, 291; Anuria, 627; Removal of birth-marks, 961; Pylorectomy for carcinoma, 962; Surgery of the kidney, 968.

MCCOSH, ANDREW J., Anæsthetics in operations for typhoid perforations, 287.

McMurrich's Development of the Human Body, Review of, 315.

Macroglossia, Case of, 321.

MANDLEBAUM, F. S., Demonstration of sarcoma of femur, 435.

Marjolin's ulcer, 450, 496.

Massage, Graham's Treatise on, Review of, 639; Ostrom on, and Swedish Movements, Review of, 639.

MATAS, RUDOLPH, Radical cure of aneurism by arteriorrhaphy, 161.

MECKEL'S diverticulum, degenerated, Intestinal obstruction from, 111; Perforation of, as a cause of peritonitis, 297.

Meningeal artery, middle, Extradural hæmorrhage from rupture of, 341.

Meningocele, spurious, 449.

MEYER, WILLY, X-ray treatment of malignant tumors, 434; Treatment of ureter after nephrectomy for tuberculosis, 606; Use of appendix to flush colon, 615; Tuberculosis of retroperitoneal glands, 620; Perineal prostatectomy, 621; Bottini operation, 622; recurrent carcinoma of breast involving costal cartilages, Excision of, 777; appendicostomy for chronic colitis, 781.

- MORGAN, WILLIAM E., Treatment of actinomycosis, 466.
 MOSCHCOWITZ, ALEXIS V., Primary carcinoma of the, 891.
 MOSELEY, HENRY PERKINS, Os trigonum detected by Röntgen rays, 766.
 Mouth and face operations, Tubage of pharynx in, 859.
 Moynihan on Retroperitoneal Hernia, Review of, 120.
 Myositis, Excision of scapula for, 918; Ossificans, 825; Ossificans traumatica, 958.

N

- Nævi, Removal of, 961.
 Needle and thread removed from abscess under liver, 950.
 NEILSON, THOMAS R., Control of meningeal hæmorrhage, 454.
 Nephrectomy for tuberculosis, 605.
 Nerve anastomosis for facial paralysis, 641.
 Neurectomy, Intracranial, 665.
 NEW YORK SURGICAL SOCIETY, Transactions of, 95, 270, 428, 437, 602, 773, 928, 938.

O

- OCHSNER, A. J., Actinomycosis, treatment by iodide of potash, 464; Stricture of œsophagus treated by gastrostomy and gradual dilatation, 785.
 OCHSNER, EDWARD H., Actinomycosis, 468; An aspirating trocar, 769.
 Œsophagotomy, Intramediastinal, 299.
 Œsophagus, Instruments for treating strictures of the, 350; Stricture of, 785.
 OLIVER, JOHN CHADWICK, Cysts in connection with the teeth, 65; Question of surgical intervention in cases of injuries to the spine, 238.

- Omentum, Transplantation of, to relieve intestinal defects, 629.
 Operations- und Verbandstechnik, Sonnenburg and Muehsam, Compendium der, Review of, 797.
 Operative Surgery, Zuckerkindl, Review of, 156.
 Orbital route for removal of second branch of the fifth nerve at the foramen rotundum, 855.
 Os trigonum detected by Röntgen rays, 766.
 Ostrom on Massage and Swedish Movements, Review of, 639.
 Ovary, Fibroma of the, 468.

P

- Pancreas, Rupture of, 108.
 Pancreatic cysts, Pathology and surgical treatment of, 226.
 Pancreatitis, Gangrenous, 942.
 Paralysis, infantile spastic, Treatment of, 415.
 Patella, Aponeurotic suture for fracture of, 962; Congenital dislocation of the, 154; Excision of, in wound in knee, 945; Rupture of ligament of, 460.
 Pathology, Review of Schmaus's Hand-Book of, 475.
 PECK, CHARLES H., Distention of the maxillary antrum, 947; Tack in the appendix, 950.
 Peritonitis from inflammation and perforation of Meckel's diverticulum, 297; diffuse, from gangrene of appendix, Recovery from, 431; Exclusion of actinic rays of light during operations for general, 798; Gonorrhœal, 619.
 Pharynx, Tubage of, in operations on mouth and face, 859.
 PHILADELPHIA ACADEMY OF SURGERY, Transactions of, III, 447, 456, 623, 951.
 PILCHER, LEWIS STEPHEN, Intramediastinal bronchotomy and œsophagotomy, 299.

Plaster jackets, Apparatus to facilitate application of, during spinal hyperextension, 92.

Popliteal artery, End-to-end anastomosis of, for gunshot injury, 719.

Presbyterian Hospital of New York, Review of Report for 1902, Vol. v, 316.

Prostatectomy, Perineal, 621, 711.

Prostatic hypertrophy, Bottini operation for, 622.

Pylorectomy, 270, 442, 444, 962.

Pylorus, benign stenosis of, Gastroenterostomy for, 940.

R

Rectal instruments, 924.

REEVE, J. C., JR., Successful removal of enchondroma of chest wall, involving the diaphragm, 724.

Renal and hepatic calculi, differential diagnosis of, Possible cause of difficulty in, 36.

Renal vessels, Hæmorrhage from bullet wound of, 948.

Retroperitoneal glands, Tuberculosis of, 620; solid tumors, Primary, 372.

Ribs, Post-typhoidal infection of, 253.

ROBERTS, JOHN B., Abdominal contusions, 624.

ROBSON, A. W. MAYO, Repair of ruptured crucial ligaments, 716.

Rockwell, Pocket Text-Book of Anatomy, Review of, 796.

RODMAN, W. L., Management of incisions in the common gall-duct, 115.

ROGERS, JOHN, Misplaced testis, 102; Sarcoma of vertebra, 103; Sarcoma of hip, 103; Ununited fracture of leg, 439.

ROSS, GEORGE, Fracture of the neck of the femur in a centenarian, 119; Perforation of traumatic intestinal ulcer, 447; Abdominal contusions, 624.

Rubber tissue, Subdural interposition of, in operations for tic douloureux, 1.

RUGH, J. TORRANCE, Hollow bone-drill, 454.

S

Sarcoma of femur cured by injections of mixed toxins, 435; of rib cured by operation and injections of mixed toxins, 440; of neck, Immunity from recurrence after removal, 938.

Scapula, Excision of, 918.

SCHAEFER, FREDERICK C., Brain protector during craniotomy with Gigli saw, 505.

Schalek on Diseases of the Skin, Review of, 635.

SCHLAPP, M. G., Tumor of brain, 279.

SCHLEY, W. SCOTT, Primary tuberculosis of the breast, 510.

Schmaus's Hand-Book of Pathology, Review of, 475.

Schmidt, Genito-urinary and Venereal diseases, Review of, 633.

Scopolamine, morphine, narcosis, 149.

Scudder on The Treatment of Fractures, Review of, 159.

SENN, E. J., Rectovesical anastomosis for exstrophy of the bladder, 290; Transplantation of omentum to relieve intestinal defects, 629.

SHATTOCK, GEORGE, Neurofibromatosis of tongue, 321.

SHELDON, JOHN G., Posterior dislocation of the head of the tibia, 87.

SHOEMAKER, GEORGE ERETY, Papilloma of the vulva in a child, 951.

Shoulder-joint, old irreducible dislocations of, Treatment of, 756.

Skin, Schalek on Diseases of the, Review of, 635; Grindon on Diseases of the, Review of, 478.

- Skull, Gunshot wound of, 607.
- Sonnenburg and Muehsam; Compendium der Operations- und Verbandstechnik, Review of, 797.
- Southern Surgical and Gynæcological Association, Transactions of, Vol. xiv, 1902, Review of, 318.
- SPILLER, WILLIAM G., Character of nerve complication in case of myositis ossificans, 960.
- Spine, Question of surgical intervention in cases of injuries to the, 238.
- Spleen, Fixation of wandering, 481; Hæmorrhage from, in typhoid fever, 108, 288.
- Splenectomy for splenic infection, 866.
- Splenic infections, 866.
- STAVELY, ALBERT L., Splenic infections, 866.
- Stenson's duct, abscess of, Plastic for, 971.
- STEWART, GEORGE D., X-ray treatment of malignant tumors, 434; Strangulated Littré's hernia, 937.
- Stomach, Cancer of, subjected to pylorotomy, 270; Fenwick on Cancer and other Tumors of the, Review of, 794; Partial resection of, for carcinoma, 442, 444; Perforating ulcer of, 617, 928, 929; Ulcer of, with hour-glass contraction, 280, 281.
- Subphrenic abscess, Left-sided, sequel to appendicitis, 472.
- Surgery, The Practice of, Review of Wharton and Curtis's Treatise on, 312; Work-book in, Review of Coville's, 160.
- Syphilis of the liver, 726.
- T**
- Talipes calcaneus, Result of operation for, 107; Equinovarus in adult, 430.
- TAYLOR, R. TUNSTALL, Osteoma of the knee-joint, 84.
- TAYLOR, WILLIAM J., Intestinal obstruction from degenerated Meckel's diverticulum, 111; Pain complicating injuries to the hip in the aged, 119; Traumatic rupture of intestine, 448; Extradural hæmorrhage, 453; Myositis ossificans, 825, 959.
- Teeth, Cysts in connection with, 65.
- Testis, Misplaced, 102.
- Tetanus bacilli infecting wound; Excision; no Tetanus, 399.
- Thumb, Supernumerary, 940.
- Thyroglossal dermoid, 96.
- Thyrolingual duct, Persistent, 56, 271.
- Tibia, Posterior dislocation of the head of, 87.
- Tic douloureux, Subdural interposition of rubber tissue in operations for, 1.
- TILTON, BENJAMIN T., Rupture of pancreas, 108; Perforated gastric ulcer, 617; Gonorrhœal peritonitis, 619; Resection of intestine for strangulation by band, 946.
- Tongue, Tuberculosis of, in an old man, resembling carcinoma, 53; Excision of, for sarcoma, 273; Neurofibromatosis of, 321.
- Toxins, Cellular, Review of Vaughan and Novy on, 638.
- Trephine, A new osteoplastic, 772.
- Trephining for cortical sclerosis, 274; for fibroma and cyst of cerebrum, 276.
- Tuberculosis of breast, Primary, 510; of femoral, inguinal, and iliac lymph nodes secondary to foot wounds, 746, 782; of femur; Hip-joint amputation, 456; of intestine, 106; of kidney, Nephrectomy, 605; of the male genital organs, 152; of retroperitoneal glands, 620; of tongue in an old man, 53.

TURCK, RAYMOND CUSTER, Hepatic duct stones, 539.

Typhoidal infection of ribs, 253; ulcer, Perforating, 283; three cases of, 287; Hæmorrhage from spleen, 288; intestinal perforations, Suture of, 380; Perforation of gall-bladder, Primary, 878, 935.

U

Ulceration, chronic, Carcinomatous changes in, 496.

Ureter, Surgery of the lower, 668.

Ureter-catheterism, 22.

Urethroplasty, 486.

Urine divisor, Cathelin's, Efficiency of, 799.

V

Vaughan and Novy, Cellular Toxins, Review of, 638.

Vertebra, Sarcoma of, 103.

Vulva, Papilloma of, in a child, 951.

W

WAINWRIGHT, JONATHAN M., Contribution to the subject of perineal prostatectomy, 711.

WEIR, ROBERT F., Diagnosis and treatment of abdominal contusions, 107.

WHARTON, HENRY R., Spurious meningocele, 449; Marjolin's ulcer, 450; Extradural hæmorrhage, 453; Simultaneous rupture of both quadriceps extensor femoris tendons, 459; Abdominal contusions, 624; Drainage in empyema of chest, 956.

Wharton and Curtis, Treatise on The Practice of Surgery, Review of, 312.

WHITACRE, HORACE J., Persistent thyrolingual duct, 56.

WHITMAN, ROYAL, Excision of astragalus for talipes calcaneus, 107; Bilateral coxa vara, 274; Congenital dislocation of the hip, 428.

WILLARD, DE FOREST, Hip-joint amputation for tuberculosis of femur, 456; spina bifida, 457; Gun-shot wound of forearm, 458.

WILSON, H. AUGUSTUS, Twist drill bone-needle, 455.

WOOLSEY, GEORGE, Sclerosis of the brain cortex, 274; Fibroma and cyst of brain, 276; Operations for typhoid perforation, 287; Littre's hernia, 937; Gastro-enterostomy for benign stenosis of pylorus, 940; Pin in the abdominal cavity, 949.

X

X-ray in the treatment of malignant tumors, 433.

Y

YOUNG, HUGH H., Surgery of the lower ureter, 668.

YOUNG, JAMES K., Myositis ossificans, 958.

Z

ZINTSMaster, L. B., Tuberculosis of tongue resembling carcinoma in an old man, 53.

Zuckermandl, Operative Surgery, Review of, 156.

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